The
Electrical Review

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Things to be Done

SO efficient is the organisation of electrical industry to-day that quite a small army of individuals are able to bring their energy and ingenuity to bear upon its fortunes. So large has it become, however, that there is a mass, which we may describe as the rank and file; but there is no valid excuse for lack of interest on the part of those constituting this mass. Electrical work and progress afford interest for all who are not content to remain in a groove.

The president of the I.M.E.A. reviewed matters of interest to all electricity supply men in his address on Tuesday. It was regrettable that the most momentous topic of the day—the future of distribution—had to be omitted from official pronouncements as the findings of the McGowan Committee have not yet been published.

Nevertheless, there are certain outstanding problems that await solution, irrespective of any system of administration or operation. On two of them Mr. Seddon left us in no doubt as to his views; these were the present tariff discrepancies between one supply area and another, and the similar differences in declared voltages.

The President reminded us that engineers are wont to pride themselves on being people who get things done. Justification for this claim from the technical standpoint appears week by week in our own columns in the record of advances made in design and operation, but in the two aspects that bring engineers most closely into touch with public opinion there have been delays in securing improvement that consumers find incomprehensible.

Yet the evils have long been recognised by engineers. We remember the setting-up before the war of a joint committee of undertakings in a large industrial area to consider the practicability of securing some measure of tariff uniformity, while the Act of 1919 seemed to envisage the possibility of compulsory standardisation of distribution systems.

Few in his audience would not be in strong agreement with the economic arguments underlying the President's plea for looking well ahead when planning mains developments. Since the last I.M.E.A. Convention was held in Edinburgh, in 1905, the kWh sold in the city has increased nearly fifteen times, the growth having been accelerated remarkably during the latter part of the period—a feature that cannot be regarded as unusual. This does not imply the burying of unproductive capital in the form of unduly heavy copper, as possible runs for high-voltage feeders to an increased number of local transforming points can be provided for at the outset.

The president stressed the need for undertakings to provide practical training for demonstrators who have secured E.A.W. certificates and require only practical experience to turn them into useful auxiliaries. A sound apprenticeship scheme should surely be of benefit.

Mr. Seddon's remarks, taken in conjunction with the papers read and the general atmosphere of the Convention, leave one in little doubt that, whatever the future may have in store for us in the way of the reorganisation of distribution, local management will still remain a chief factor in electrical development. The conditions of engagement must, therefore, be made such as to attract the best type of men for the work that has to be done.

Municipal Progress

IT is apparent, from those reports of municipal electricity undertakings for the last financial year so far published, that the more intense electrical propaganda, which is now becoming more general, is bringing its reward. The Southend-on-Sea Electricity Department has its troubles in the way of idle capital

through numerous connected properties being vacant and the heavy drain on its resources by way of contributions to rates and illuminations, but the increase in sales, 10,600,000 kWh, and the proportionate advance of 27.3 per cent. are both records in the history of the undertaking. Cleethorpes, where the complete system functioned without interruptions of any kind, shows an increase in electricity consumption of no less than 41 per cent., fully justifying the Council's decision last autumn to extend its hire and hire-purchase arrangements to appliances other than cookers. Chesterfield now has 94 per cent. of the premises in its area connected, with 14,523 domestic appliances on circuit. There was a 28 per cent. increase in electricity sold for heating and cooking and on the combined domestic rate. At Lincoln, in spite of inadequate showroom accommodation, the amount of electricity sold for domestic purposes increased by 30.5 per cent.

Electricity and the Farmer

IF people are to be attracted "back to the land" (and kept there), rural living conditions must be improved. Much has already been done towards better housing and the provision of amenities, but much remains to be done. By far the best road to the desired end is the electrical way. The provision of a reliable electricity supply at reasonable cost can do more than anything else to raise the standard of country life to something approaching the urban level. In one of the special articles in this issue Lord Eltisley, the president of E.D.A., takes this as his theme, and points the way to its realisation. The author's intimate practical knowledge of the applications of electricity on the farm, allied to his acquaintance with the electrical industry, makes him peculiarly fitted to give some sound advice on the subject. He shows that the farmer is not the "stick-in-the-mud" of popular urban belief, but a live, up-to-date business man who wants electricity if he can get it at a satisfactory price. Lord Eltisley suggests means of providing a cheap supply and discusses the provision of appliances on easy terms. He stresses the need for talking to the farmer in his own language, implying the employment of salesmen who can rise above the banalities which are often considered good enough for the townsman and woman.

Industrial Heating

MOST industries require heat in some operation or other, and in many more than is usually supposed the potential heating load greatly exceeds the motive power load. The diversity of the applications for which electricity is suitable was shown by Mr. E. M. Ackery in our issue of May 8th. Secrecy on the part of manufacturers as to the economies achieved by electric heat treatment is sometimes blamed for the meagre data available, and the information based upon working results given by Mr. W. Y. Anderson this week should therefore be useful to those engaged in developing this load. The potentialities of electricity as a heating agent in industry are certainly not yet properly appreciated. That is why it is so necessary that a supply undertaking's representative should be able to talk to those engaged in the metal industries not only as an electrical engineer but as one with intimate knowledge of the processes for which he prescribes heat treatment.

Air Conditioning

THE production of atmospheres, the temperature and humidity of which can be adjusted to meet the conditions desired, should provide a substantial electrical load all the year round. In many directions, such as the textile industry, air conditioning can show more immediate economic advantages, while there can be few public buildings or restaurants where its obvious benefits would not later be translated into profits. Incidentally air filtration has been found to prevent hay fever. In Chicago the load has been intensively developed during the past three years and the 40,000 kW connected in over 900 institutions brings in an average revenue of $12 per kW. Acording to the *Bulletin* of the Edison Electric Institute, steam-ejector systems are also making some headway in the United States and dehumidifiers using silica-gel with gas heating are being tried. Although favourable reports have been received of a new electrically driven centrifugal water-vapour machine as a competitor of the steam-jet method, it is clear that air-conditioning will not come the way of electricity as rapidly as it should do without effort on the part of our industry.

E.I.B.A. Appeals

WE hope that when those of our readers who have "made good" in the electrical industry are making their wills, or are adding codicils to those already made, they will do as Mr. Seabrook asks in our "Correspondence" section to-day and remember E.I.B.A. We have made appeals of this nature in the past and believe that our suggestions have not fallen upon deaf ears; who can say how many interesting bequests will see the light of day when seals are broken? May the funds ultimately receive substantial aid as the outcome of the renewal of the appeal. We are glad to learn from Mr. Eck that the votes asked for (ELEC. REV., April 17) on behalf of several children were sufficient to secure admission of two of them to an orphanage, with the prospect of the third being successful in November next. Thank you!

Limited Water Heating

THE main criticisms of Mr. Lake's I.M.E.A. paper on water heating on Tuesday were directed at his views on lagging and thermostatic control, which he does without. It may be presumed that his practice is decided to meet the needs of one large group of consumers, the "municipal parlour" type. His figures showed that he has had considerable success within these limits, and in his reply he stated that he dealt in heaters other than circulators on the hire-purchase system. If the author was in a minority of one, it was probably because the title of his paper should have been—as was suggested by one speaker—"A particular application of domestic water heating." We do not think Mr. Lake should be accused of seeking to supply only the cream of the load because he concentrates at this stage on a demand that can be met cheaply, but the use of unlagged tanks merely on the ground that they provide airing facilities is an expensive way of using B.th.u. Thermostatic control is one of the great points in favour of electric water heating, as it affords the surety without thought of the "constant hot-water supply" which exercises so strong an appeal to the average householder.

Summer Conventions

WHILE electricity supply affairs have drawn a very large number of engineers to Edinburgh this week, Brighton also has been visited by representatives of another section of the industry. The Tramways, Light Railways and Transport Association met there yesterday for its annual congress and the proceedings close to-day. The trolley bus, which is making such rapid progress, was the subject of yesterday's paper and discussion, while to-day merchandising passenger transportation is the theme. Members of the Institution of Electrical Engineers are packing their bags for next week's summer meeting in Scotland, and if the weather conditions are favourable they should have a profitable time seeing important electrical works which they might not otherwise have had an opportunity of inspecting.

Key Industries

ON Tuesday this week the House of Commons approved Clause 5 of the Finance Act providing for the continuance of the Key Industries Duties for a further period of ten years. An amendment was moved to exclude parts of radio valves and similar rectifiers from the scope of the duties on the ground that a monopoly in these valves had been created and prices were being maintained at too high a level. Dr. Burgin (Parliamentary Secretary to the Board of Trade) said that these valves were an essential factor in national defence and the amendment was rejected.

From Our Special Representatives

EDINBURGH, SUNDAY.

FINE sunny weather greeted early arrivals at Edinburgh yesterday, with the usual pleasant breeze along Princes Street. The same conditions hold to-day, leading to the hope that by having the Convention 400 miles north of London we have escaped the cold and rain.

Coming up the steps from Waverley Street Station one cannot fail to notice at once the signboard advertising the I.M.E.A. exhibition as the largest electrical show of industrial and domestic apparatus ever staged in Scotland.

Almost inevitably the visitor asks himself whether Princes Street justifies its reputation as the finest in the United Kingdom—and further afield also; just as inevitably he will, we believe, answer in a manner likely to satisfy the legitimate pride of our civic hosts. The Castle, with its famous war memorial shrine, and the monuments on Calton Hill, which are one of the reasons for the description of Edinburgh as the "Athens of the North," both make the best of the past and the present in their dignified floodlighting treatment after dark. These are advantages that would give any city a long start in competition with any rivals.

The public gardens down one side of Princes Street between the main thoroughfare with its up-to-date electric tramway service (presenting so great a contrast with the old cable-car system as we remember it) and the Castle-crowned hills lend an air of spaciousness that seems somehow symbolic of what Edinburgh has stood for.

Here there is, however, a " worm i' th' bud." At the bottom of the ravine a railway runs parallel with the roadway. That of itself would not matter, as the foliage is thick enough to screen undesirable features; but it is unable to hide the smoke belched forth, as we write, from six locomoives on sidings and from two more drawing trains, which are diving under the Art Gallery to reappear on the other side trailing clouds that are assuredly not of glory. Although Edinburgh deserves the name " Auld Reekie " less than most large towns do, it is to be hoped that long before the next Convention is held here this source of atmospheric pollution will be electrified away.

Mrs. S. Gardner greets guests at the President's reception on Monday evening

Other illumination schemes noticeable in the few June hours of darkness are the Scott Memorial and two special public

Mr. Seddon delivers his address at Tuesday morning's session

Early arrivals at the Convention offices on Monday

lighting demonstrations arranged by the General Electric Co., Ltd., and Philips Lamps, Ltd. The first consists of twelve 400-W "Osira" lamps on double brackets fitted to six existing tramway poles in the centre of George Street, and the second of the same number of 150-W "Philora" sodium lamps in Fairmilehead Road, mounted at 23 ft. and spaced at 120 ft.

Wifely solicitude: Mrs. P. J. Robinson adjusts Mr. Robinson's badge

apart. The latter are in "Liverpool" lanterns designed by Mr. P. J. Robinson and manufactured by the Wardle Engineering Co.

Possibly due to the greater space available at the exhibition this year there are not many outside shows. The only temporary one we have found so far is that of Messrs. Johnson & Phillips, Ltd., in Hanover Street, where switchgear and overhead line equipment (including the new "drop-down" high-voltage fuses and the "Wonpeace" insulator for service wires) and condensers are displayed. Hanover Street is normally an electrical centre, as in addition to the B.T.H. refrigerator showrooms, part of which have been taken by J. & P. for the occasion, the G.E.C. and the Sloan Electrical Co. have branches there. Among the early arrivals yesterday at the Caledonian Hotel, the Convention headquarters, were the President, Mr. E. Seddon, and the secretary, Mr. J. W. Simpson, supported by a small panel of "elder statesmen" in the persons of the last two preceding presidents, Messrs. E. E. Hoadley (Maidstone) and P. J. Robinson (Liverpool). Mr. F. W. Purse (London J.E.A.), another ex-president, was also there with his chairman, Alderman J. Chuter Ede, M.P., Mr. F. Whysall (Belfast) and Mr. V. Dale (E.D.A.).

MONDAY.

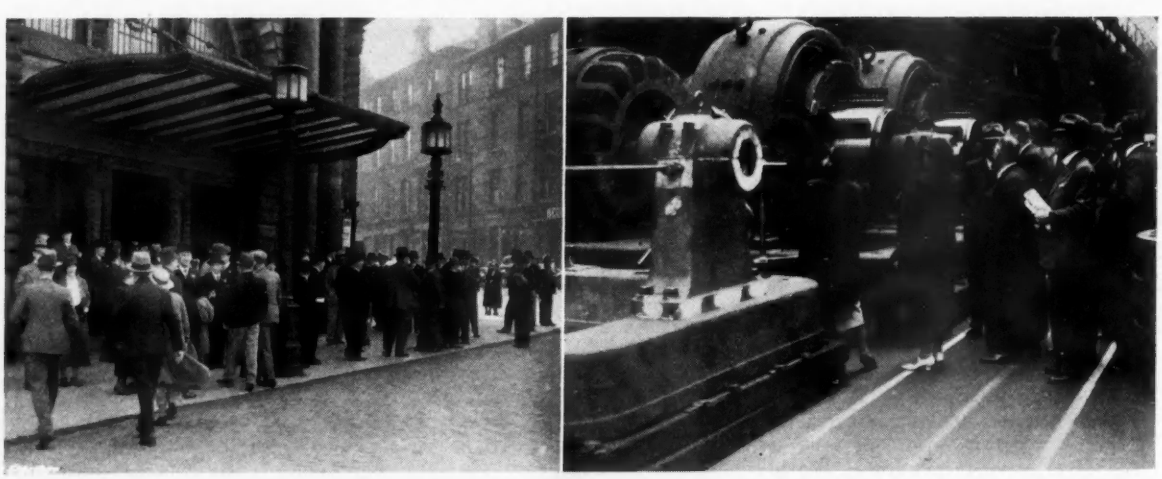
There was a huge influx of delegates last night, and no doubt due partly to this and partly to the official opening of the exhibition taking place this afternoon (a day earlier than usual) the throng at the Convention office at 10 a.m., when "badging" started, was greater than we can recall at the same hour on any previous occasion. The E.I.B.A. was ready to take toll of callers, as usual, for its beneficent work.

Badging time is always one of the most pleasurable experiences of the electrical year, in the opportunities it affords of meeting friends (often with the added spice of unexpectedness) perhaps for the first time since the previous Convention. One consolation for the passage of time marked by each succeeding annual meeting is that the number one looks out for steadily increases.

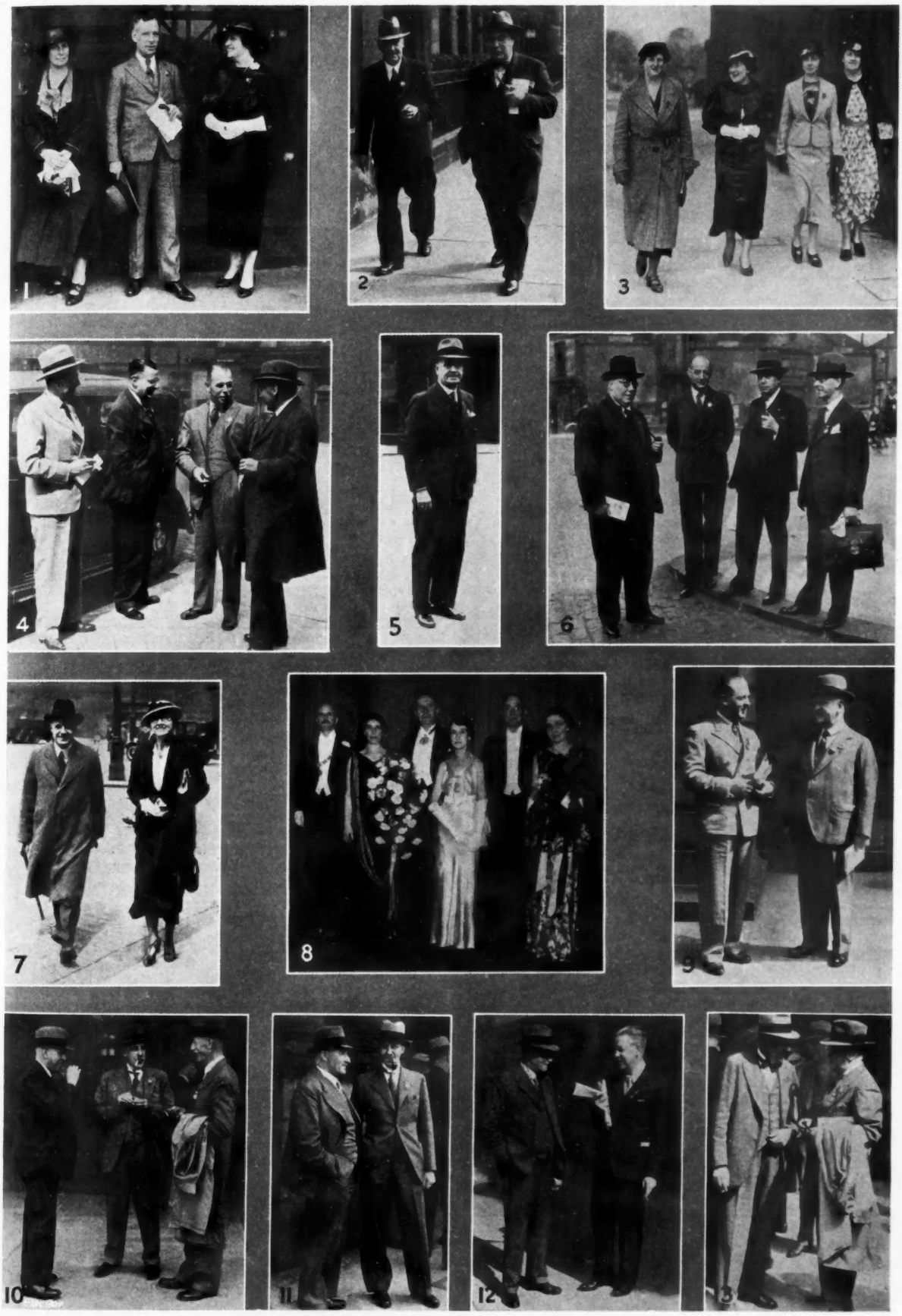
This year the chances in favour are increased by more than one-third, as the fifteen hundred delegates surpasses to that extent the number recorded in 1934, the previous high-water mark, leaving out of account last year's Convention at Bournemouth as not strictly an I.M.E.A. affair.

Various discussions with divers folk left just enough time before lunch to have a look at the showrooms of the Corporation and of Carron Company in George Street, of Cole & Co. (contractors) in Frederick Street, and the electrical display provided by Jenners Stores in Princes Street.

One can hardly fail to notice the number of opticians who



Left: Delegates arriving at Usher Hall for the first session on Tuesday morning. Right: Inspecting motor convertors for the Birmingham Corporation at the Bruce Peebles works

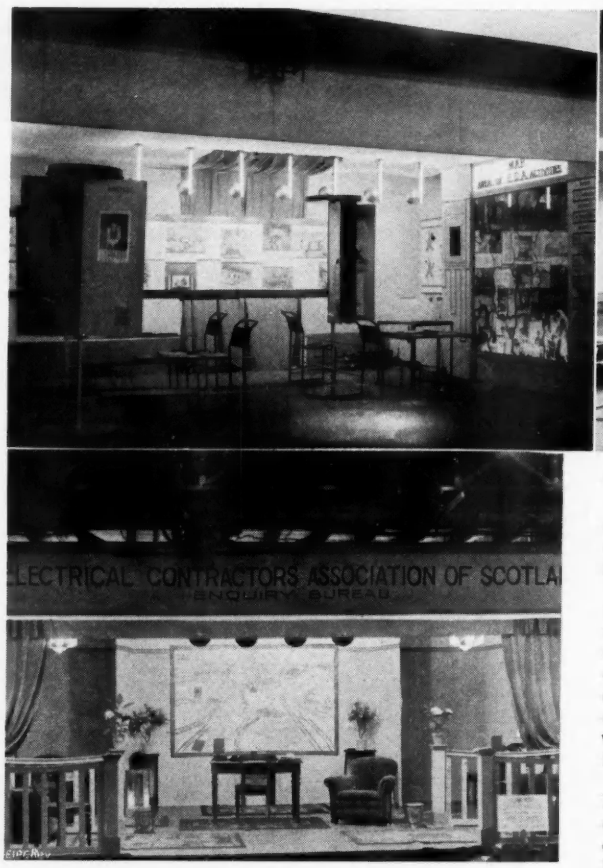


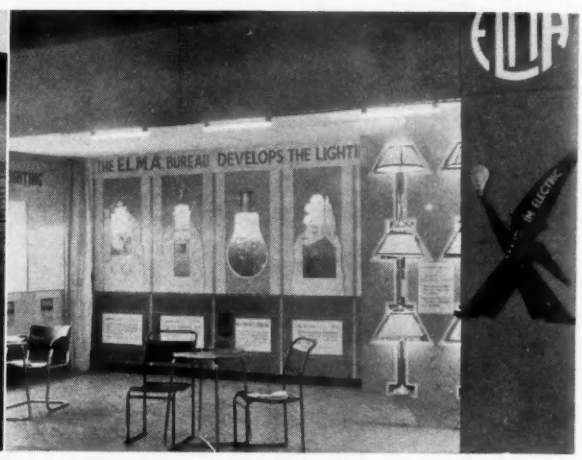
Caught by Our Camera at Edinburgh

1. Miss Haslett, Mr. V. W. Dale (E.D.A.), and Mrs. Pender Chalmers. 2. Messrs. Price F. White (Bangor) and A. J. Hutchinson (Farnworth). 3. Mrs. H. C. Day (Heywood), Miss Thompson, Mrs. A. H. Todd (Clitheroe) and Mrs. J. H. Thompson (Colne). 4. A G.E.C. group: Messrs. A. M. Anderson, T. G. Travers, H. Neilsen and P. J. Sims. 5. Mr. Frank Forrest (Birmingham), the president-elect. 6. Councillor H. Deacon and Mr. V. A. Pask (Norwich), with Messrs. E. E. Hoadley (Maidstone) and J. W. Simpson (general secretary). 7. Sir John and Lady Brooke. 8. At the President's reception: Mr. E. Seddon and Mrs. Seddon, the Lord Provost and his wife, and Baillie G. Gardner and Mrs. Gardner. 9. Messrs. L. C. and E. E. Sharp (Venners). 10. Messrs. D. Martin and and H. W. Clothier, of Reyrolle's, and Mr. R. B. Mitchell (Glasgow). 11. Mr. B. Handley (Portsmouth) and Mr. C. G. Morley New (Electricity Commissioner). 12. Ald. W. Walker (C.E.B.) and Mrs. J. N. Waite (Hull). 13. Messrs. C. H. Dobell and A. J. Fuller.

have put in "light-sight" windows, complete with study lamps. This most satisfactory indication of a willingness to co-operate with the electrical industry in its "better sight, better light" movement was, we afterwards ascertained, brought about by Mr. T. Catten, of the Scottish Lighting Service Bureau, who has succeeded in persuading no fewer than seventeen opticians in Edinburgh to follow the right road.

In the afternoon the exhibition in Waverley Market was





Three association stands in the exhibition: E.D.A., E.L.M.A., and the E.C.A. of Scotland

opened by Lord Salvesen, P.C., who referred to himself as a typical consumer who had long used electricity, particularly on his estate, for every practicable purpose. He had also been associated with the industry in other ways, such as in the Edison-Bell patent litigation of 1882 and in the inquiry that resulted in Glasgow having municipal telephones before the service was nationalised. He understood that the exhibition had as its laudable object an increase in the consumption of electricity. As one who had spent half his life without the advantages of electricity he could appreciate its merits all the more. Baillie G. Gardner (convener, Electricity Committee) and Mr. E. Seddon (president, I.M.E.A.) briefly thanked Lord Salvesen and the Lord Provost of Edinburgh (the Rt. Hon. L. S. Gumley), who presided.

The exhibits are dealt with in another article in this issue, but there is one stand, constituting a surprise item, which is not expected to contribute towards the commercial expansion of the industry. Its purpose is to help some of those who have contributed towards its expansion but who have not shared in its good fortune. That is the small stand of the Electrical Industries Benevolent Association, to which we found Mr. E. E. Sharp putting the finishing touches while engaged in selling cable. In this there is no rivalry with the cable companies exhibiting, as the merchandise is part of the original Ferranti 11-kV concentric paper-insulated cable presented by the London Electric Supply Corporation and made into paper weights by Mr. H. Marryat. These can be obtained for £1 1s., and greater lengths are available for more money, while one of the original Ferranti cable joints, dug from the ground at Charing Cross Bridge, ripped and mounted, costs £25.

A peculiarity of these joints (which occurred at every 20 ft. or so) is that they are purely mechanical, no solder being used. Three cables remained in use until two and a half years ago, when the 11-kV single-phase system was closed down after having been in use for forty-three years. Another E.I.B.A. effort arranged by Mr. H. Seabrook was the sale of book-matches on all stands.

So far as can be ascertained at the time of writing exhibitors seem exceedingly pleased with the Waverley Market, especially on account of the additional space available this year which gives them better scope for display. Although the low roof does not lend itself well to general illumination, the arrangements made seem quite effective.

TUESDAY.

Last night the President and Mrs. Seddon, supported by Baillie G. Gardner and Mrs. Gardner, received the guests at the Assembly Rooms, George St. Between the modern dances of the subsequent ball, opportunities were given to those who could boast of Highland blood to exhibit their prowess in native reels, authentic kilts giving a pleasing local colour.

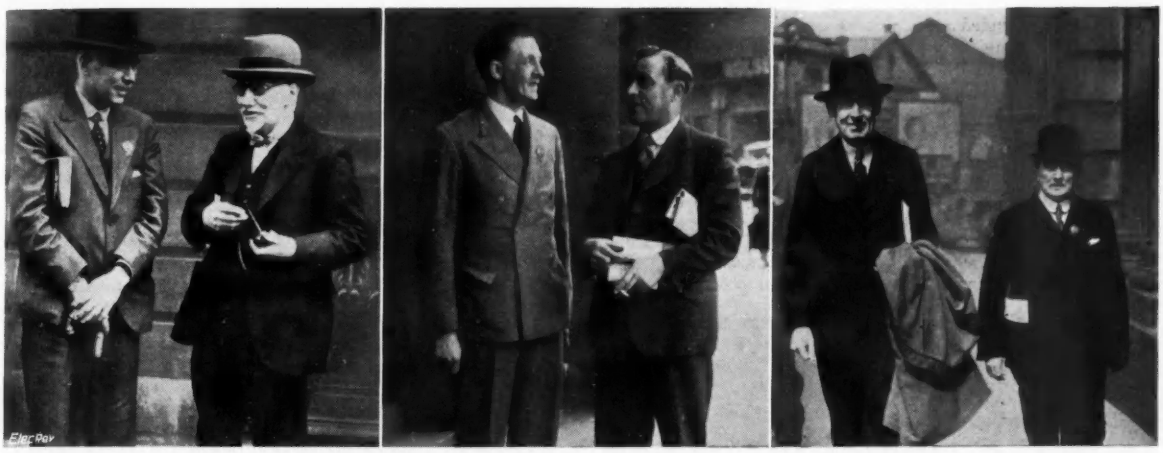
Conversation with old friends included a reference to the sad lot of a would-be progressive chief who had recommended the appointment of a consumers' engineer. Proposal turned down by Council on the ground that none was needed in view of the special local conditions—said to be the same as anywhere else. Also, report of conversation among non-electrical people overheard at a hotel to the effect that 6,000 engineers at least were attending the Convention—an attempt no doubt to express its importance quantitatively.

This morning the first session was opened by the Rt. Hon. L. S. Gumley (Lord Provost of Edinburgh) who stated as an example of the progress made in Edinburgh that the number of consumers had increased from 24,500 to 75,000 within the last twelve years. The President read the draft of a telegram which it was agreed should be sent to the King and then delivered his address (an abstract of which appears on page 849). Sir Percy Bower (Birmingham) proposed a vote of thanks to Mr. Seddon which was seconded by Alderman W. H. Thickett (Grimsby).

Mr. G. H. Lake (Nottingham) then gave a commendably brief summary of his paper on "Water Heating," thus leaving ample time for discussion. Those who took part in the latter had evidently carefully studied the advance copy so everything was gained by this departure from the usual procedure.

Mr. W. J. Jones (E.L.M.A.) does his bit for the E.I.B.A.

There seemed to be agreement with Mr. Lake's view that it would be better to turn down an application for water heating if it was unlikely to give satisfaction, but many speakers held that with apparatus properly selected for any particular case entirely good results should be possible, and that a supply



Left: Mr. A. C. Cramb (E.D.A.) and Baillie J. Clouston. Centre: A contractors' conference—Mr. A. G. Bruty, president of the E.C.A., with Mr. L. C. Penwill, director. Right: Lt.-Col. W. A. Vignoles, D.S.O., and Mr. J. D. Knight (Ealing)

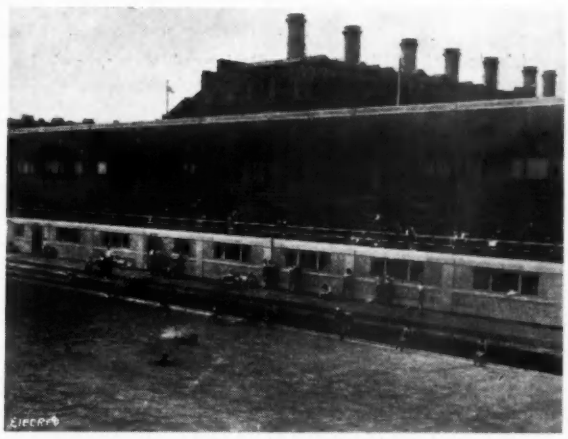
undertaking should not be satisfied merely to secure the cream of the load. The merits of the 1½-gal. tank in the kitchen, giving water at a higher temperature than that provided by

Leaving for Portobello power station

the main heater and cut out of service when the cooker is in use, were also referred to. One plumber-wireman and an apprentice, it was said, should do everything in connection with the installation of a water heater.

Prices corresponding to three or four units for a penny were advocated by some. Mr. Lake, replying briefly said that his chief idea had been to meet a demand under the conditions referred to in his paper, and for these he had provided hiring facilities. Other types appropriate for other circumstances could be obtained on hire-purchase terms. Mr. R. W. L. Phillips (Bedford), thanking the author, urged that as the water-heating load was beginning to expand rapidly, now was the time to see that it was on right lines.

In the afternoon over 700 delegates went by coaches, provided by the Corporation, to inspect Portobello power station and/or Bruce Peebles works at East Pilton. These have both been described in recent issues of the ELECTRICAL REVIEW. Tea was provided in a marquee by Messrs. Bruce Peebles and Co., when the President referred to the fine engineering qualities of the transformers produced by the company; more than 90 per cent. of those on his mains were built there.



The swimming pool at Portobello which is warmed by the condensing water from the power station in the background

Dr. Watt (chairman, Bruce Peebles & Co.) in responding, regretted the absence of the managing director, Mr. G. L. Kirkpatrick, who is recovering from a recent illness. Mr. Rogers (works manager) and Mr. G. G. L. Preece (sales manager) also spoke.

The Lord Provost's reception and ball at the Assembly Rooms on Tuesday evening

The busy day ended with a reception by the Lord Provost, Lady Provost, Magistrates and Council of the City of Edinburgh, which was followed by a ball.

WEDNESDAY.

Despite a late night there were 630 delegates on the Waverley Station platform at nine o'clock this morning awaiting the two special trains which had been chartered to take them part of the way to the Grampians. Many more would like to have gone, as shown by a waiting list of about seventy at the Convention office, but there will be some compensation for the disappointed ones in the drive to Lauriston Castle on Friday afternoon.

On arrival at Pitlochry before noon, the party re-embarked on motor coaches bound for Kinloch Rannoch by a route which took in Killiecrankie, Bridge of Garry, and Loch Tummel, skirting the base of the lofty Schiehallion, the best of the splendid mountains for which Perthshire is famous. The needs of the tourists would have been enough to test the catering resources of the most metropolitan of hotels, but the three at Kinloch rose manfully to the occasion.

In the afternoon the serious business of the day started when after passing along the shore of Loch Rannoch the first hydro-electric station of the Grampian Electric Supply Co. was reached. This, with the Tummel station, which was visited after tea, was described briefly in our last issue.

To those who took part in it, the tour showed what is meant by "Caledonia stern and wild," which in the civilised conditions of the capital city would have otherwise escaped them.

THURSDAY MORNING.

To-day is devoted purely to business. Big business is indicated in the paper on "Large-scale Electric Cooking," by Messrs. W. E. Swale and S. C. Hurry.

At a luncheon of the Edinburgh Rotary Club (North British Station Hotel), Mr. E. E. Hoadley, the immediate past-president of the Association, is to talk on "Modern Aspects of Electricity Supply," while concurrently, at the Assembly Rooms, the E.A.W. is giving a luncheon.

"Street Lighting," is the afternoon subject, the paper being presented by Messrs. P. J. Robinson and J. N. Waite. In the evening the annual banquet and ball is being held.

Friday's proceedings include the annual general meeting and a visit to Queensferry (Forth Bridge) and Lauriston Castle.

The President and Council of the Incorporated Municipal Electrical Association

The President-Elect of the I.M.E.A.

MR. FRANK FORREST, the vice-president of the Incorporated Municipal Electrical Association, was born at Old Charlton, Kent, and will thus be third out of the four most recent presidents to come from that county, ignoring the subtle distinction between men of Kent and Kentish men. After serving a five years' apprenticeship with Messrs. Siemens Bros. & Co., Ltd., Woolwich, Mr. Forrest took up an engineering appointment on the *Alberta*, the Royal yacht of King Leopold II of Belgium. Returning to shore life after eighteen months, he became successively chief assistant electrical engineer to Tynemouth Corporation and assistant station engineer to the Charing Cross Electricity Supply Co.

His connection with the Birmingham undertaking began in 1906, when he was placed in charge of the Sub-stations Department and was also responsible for the electrical plant and switchgear in the generating stations. Then he became chief assistant engineer to the late Mr. R. A. Chattock, and on the retirement of the latter six years ago he was appointed city electrical engineer. On March 1st of this year Mr. Forrest took complete control of both the engineering and commercial sides of the undertaking as chief engineer and manager.

[Lafayette

Mr. F. Forrest, chief engineer and manager of the Birmingham undertaking, is the president-elect of the I.M.E.A.

The change of frequency in Birmingham, which has involved an expenditure to date of approximately £2,000,000, together with the raising of the transmission voltage from 5 to 11 kV and the change from d.c. to a.c. in the low-voltage networks in the outer area of the city, has added greatly to his responsibilities. This work is still in progress, as well as extensions to the generating plant, which, inclusive of auxiliary works, entails an expenditure of approximately £3,000,000. These extensions include the provision of three 50,000-kVA turbo-alternators, seven large boilers and three ferro-concrete cooling towers at Hams Hall.

The undertaking is now the largest under municipal ownership in the United Kingdom. Developments during the six years in question are exemplified by an increase in the total capital expenditure to £14,600,000 at March 31st last from the £11,000,000 at which it stood on the same date in 1930.

During the same period the gross annual revenue has risen from £1,853,000 to £2,600,000, the number of consumers from 80,000 to 182,000, and the kW connected from 332,000 to 660,000. In the meantime the kWh generated per annum has grown from 431 million to 825 million.

A further development for which Mr. Forrest has been responsible has been the construction and putting into service of large electrostatic flue-gas cleaning plants, operating in conjunction with the 350-ft. chimney stacks at both Hams Hall and Nechells stations; the total cost of this work is about £175,000.

Mr. Forrest is a member of the Institutions of Electrical, Civil and Mechanical Engineers and is a past-chairman of the I.E.E. Midland Centre and has been president of the Birmingham University Engineering Society. He is a member of the National Technical Consultative Committee set up by the Central Electricity Board and is also chairman of the District Consultative Committee for Central England.

On behalf of Birmingham Corporation, Mr. Forrest has studied supply conditions abroad, having visited many of the large undertakings in the United States, Canada and Germany and other parts of the continent. As a recreation he prefers golf.

The Presidential Address

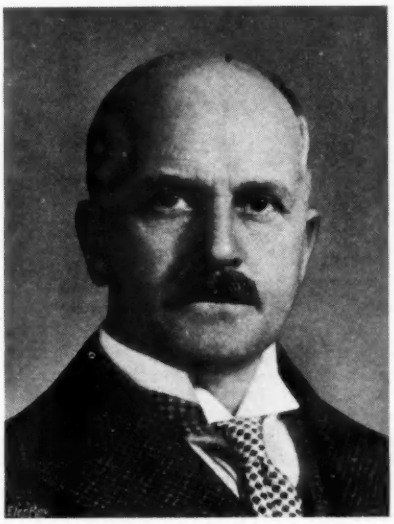
Mr. E. Seddon reviews electricity supply questions

THE president of the Association commenced his address by urging members who were not already doing so to support the British Electrical Development Association and the British Electrical and Allied Industries Research Association, while the British Standards Institution's efforts to secure uniformity should be made effective. The training scheme of the Electrical Association for Women should be encouraged by the provision of a channel between the supply of demonstrators from colleges and their useful employment in showrooms. He hoped that members would give consideration to this suggestion.

The proportions of invested capital in generation and distribution were 33 and 67 per cent. respectively. That the savings in invested capital and annual expenses expected as the result of the reorganisation of generation had not yet been achieved was, Mr. Seddon thought, due in some measure to lack of time for the liquidation of capital on works rendered redundant.

The levelling out of the first costs of energy to distributing authorities under the new system was to some extent being realised, but perhaps not so fully as some had hoped. A uniform national rate of charge to all customers would seem to many to be a reasonable policy for a national body, and the president expressed the hope that the barriers to the realisation of this ideal would speedily be removed.

The unification of declared voltages could be accomplished with benefit to the industry, but the cost would be considerable. It was to be regretted that the opportunity was not taken to standardise voltage in all the areas in which frequency change had recently been effected.



[*Elliott & Fry*

Mr. E. Seddon, the president of the I.M.E.A., is city electrical engineer of Edinburgh

It was in connection with tariffs, however, that the more far-reaching implications arose. To standardise a range of tariffs it would seem necessary: (*a*) to raise the lower scales and lower the higher scales to the weighted average; (*b*) to unite the high tariff areas administratively and financially with the adjacent low tariff areas and (without raising the lower tariff levels) to depend upon increased sales and decreased costs to hold the balance between revenue and expenditure on the correct side.

Any attempt along these lines would require a co-ordinating authority, with powers either to pool the revenues of the industry and meet the expenses of each undertaking out of the common pool, or to re-allocate the whole country into areas chosen solely to facilitate the development of supply to the full, and of such magnitude and population that each would be self-supporting at the common scale of tariffs. As a safeguard in this latter case, it might be necessary to build up a central fund, not only to meet the expenses of the co-ordinating authority, but to act as a reserve against any differences of expenditure over revenue where events falsified the estimates prepared for any area.

Whatever form the undertakers in those standardised areas might take, there were two essential conditions which should be guaranteed: (1) A maximum of freedom to the local executive in adapting the policy of the central authority to the needs and circumstances peculiar to his district. The securing of new consumers and the satisfaction of existing consumers were matters requiring tact and enthusiasm with power to implement promises promptly and, within limits, to vary conditions to the need of the individual service. These were factors which might tend to be stultified under centralised control, unless it was wisely and flexibly administered. (2) The second essential condition was that after all the legitimate and well-defined charges of the industry had been met and a sufficient central reserve accumulated, the trading surplus should go back into the industry in the form of improved service or reduced charges, or both. Such charges could only be effected by legislation.

In anticipation immediate policy should be to plan on a scale larger than any mere technical estimate would foreshadow, and at the same time to remove every obstacle from the path of the prospective consumer. The objective should be a loading of (say) four times the present demand.

Assuredly the time would come when such a volume of business would have to be dealt with, and piecemeal measures and temporary expedients were the worst possible and the most expensive form of preparation for it. The network should be kept flexible and be planned on generous lines, with high voltage brought as near as possible to consumers' terminals.

The appropriation of the trading surplus for the reduction of rates was unjust and should be actively contested by the local management.

The opening of the electrical exhibition, housed in the Waverley Market, by Lord Salvesen, P.C., LL.D., on Monday morning. The Lord Provost of Edinburgh (the Rt. Hon. L. S. Gumley) is in the chair

Water Heating

Paper read on Tuesday morning by Mr. G. H. Lake, M.I.E.E.

IN presenting this paper Mr. Lake (Nottingham Corporation) does so with the conviction that the subject is a "load builder." He says that his own conversion is of recent date, for it was not until he visited the Continent in 1928 that he fully appreciated the potentialities. He has since proved the practical value of domestic water heating in his own area of supply.

The response was at first discouraging because, while a reasonable number of consumers were prepared to hire-purchase a heater, they would not carry out at their own expense the necessary plumbing and wiring, particularly when they occupied rented premises. Accordingly a hire system has been adopted by his undertaking and a circulator type of immersion heater (inserted through the top of the hot-water tank) has been standardised because its first cost is reasonably low; it will supply hot water to all taps in the house; not occupy any space in the bathroom; plumbing work and cost are the minimum; it will work in conjunction with, or independently of, a coal-fired boiler; and deliver quickly a reasonable quantity of really hot water (from cold).

[*W. W. Winter*
Mr. G. H. Lake is city electrical engineer of Nottingham

A 3-kW circulator, without pilot lamps, was chosen, controlled by three-heat series-parallel reciprocating switch, because it is cheaper to purchase and maintain; avoids tank lagging cost and does not deprive the consumer of heat in the airing cupboard; while thermostatic control prevents the user having any knowledge of, or control over, the amount of electricity used for heating water. The author considers the last-mentioned reason to be of particular importance.

The rental is 3s. per quarter, including plumbing, 40 ft. of wiring and free maintenance. A reduced hire charge of 2s. 6d. per quarter is offered to consumers who agree to hire a cooker as well. This reduces the installation cost and does not increase the maximum demand, since a change-over switch is added (at the cooker end) to prevent both appliances being used at the same time. The average cost to the undertaking of a water-heater installation carried out by the undertaking is £4 15s. 4d.

During the first month of the scheme (May) applications totalled 349, falling to forty-seven in November. The introduction of canvassing then increased applications again to 183 in January and to 191 in February.

The author expresses his views on canvassing and also enumerates types of hot-water systems and pipe layouts which should be avoided as likely to cause trouble.

Regarding the form of hire agreement, in addition to the usual clauses, only two specific conditions seem necessary. One stipulates a minimum period of two years, and the other reads "available only to domestic consumers for use in conjunction with an *approved* existing hot-water system." The latter has proved to be of the utmost importance.

In twenty-nine instances only have the heaters themselves proved to be faulty, which the author says is a real compliment to the manufacturers. In seventy-eight cases of vacated premises the incoming tenants refused to take over the installations. Only the switchgear and the actual heater (which is replaced by a "screwblank") are removed in these cases.

The cost of maintenance for twelve months (1935) was £171 17s. 9d., or 12.18d. per heater. In addition, reclaiming and reconditioning (as distinct from maintenance) totalled £31 16s. 10d. for the same period.

The value of the "installed" load represented by 5,000 water heaters is 15,000 kW, the average consumption being about 1,200 kWh per heater per year. The consumption has been greatest during the two summer quarters, the average between March and September being 863 kWh. The two years' activities in Nottingham represent the future sale of approximately six million kWh annually, a figure which is being added to daily.

While the author is not generally in favour of any restriction being placed on the consumer, he considers that the combined cooker and water-heater scheme has outweighed any of the suggested disadvantages. To this extent, therefore, the diversity of the water-heating load in Nottingham may be said to have been artificially increased. The author suggests that, partly due to the very high natural diversity and partly to the combination scheme, the water-heating load has not increased the maximum demand on the Nottingham undertaking. A set of load curves for the past five years are included in the paper for comparison.

WATER-HEATERS INSTALLED AT DECEMBER 31st, 1935.

Supply authority.	Scheme commenced.	Type of heater.	Number of installations (hire and/or hire-purchase).	Loading per heater.	Total kW. installed.	Average installation cost per heater.	Annual average maintenance cost per heater.	Degrees of hardness of water supply.
BRISTOL	Nov. 1933 Jan. 1935	Self-contained ... Self-contained ...	10,736 124	½ kW. 1½ kW.	6,500 kW.	£ s. d. *a* 2 5 6 *b* 4 0 0	s. d. *c* 2 8 *c* 3 0	Temporary 14 to 16. Permanent 4 to 5.
DERBY	Jan. 1933 Jan. 1933	Self-contained ... Immersion ...	508 890	½ to 2 kW. 2 and 3 kW.	367 kW. 1,805 kW.	*d* 1 16 9	2 0	8 to 9.
LIVERPOOL	Jan. 1933	Immersion ...	2,734	.06 to 3 kW.	7,306 kW.	2 0 0 to *e* 10 10 0	—	2.
NOTTINGHAM	May 1934	Immersion ...	4,325	3 kW.	12,975 kW.	*f* 4 15 4	1 0.18	19.3 to 4.9.
PORTSMOUTH	1927	Self-contained ...	5,395	0.75 to 1.2 kW.	5,000 kW.	1 0 0 to 1 15 0	3 6	22 to 23.
SOUTHEND-ON-SEA ...	Apr. 1934	Self-contained ... Immersion ...	1,826 5,584	1 kW. 2 kW.	1,826 kW. 11,168 kW.	*g* 4 19 6 *g* 4 10 0	1 2	Temporary 3.5. Permanent 9.
WIMBLEDON	July 1923 May 1930	Self-contained ... Immersion ...	5,740 3,018	½ to 3 kW. 2 to 3 kW.	4,669 kW. 6,279 kW.	1 10 0 to 1 13 6 2 7 6 to 2 17 6	*h* 0 10 0 2	16 to 18.

a (Bristol) Includes an average of 16/– for plumbing work. *b* (Bristol) Includes £2 for the plumbing for bath and wash-basin. *c* (Bristol) Includes complete maintenance both on water and electrical side, and cleaning. *d* (Derby) Does not include cost of apparatus or lagging. For self-contained heaters there is an additional approximate cost of 15/– per heater for plumbing, this being chargeable to the consumer. *e* (Liverpool) This figure represents the maximum cost of conversion. *f* (Nottingham) Includes cost of plumbing. *g* (Southend) Includes complete installation, i.e., apparatus, plumbing, fixing, etc. *h* (Wimbledon) Does not include cleaning out, which is dealt with every 18 months to 2 years for each heater at an average cost of 1/4 per self-contained heater, for labour and material.

Such business has not been obtained, nor is it maintained, without endeavour. Persistent efforts have been made by publicity to create interest in and popularise the use of water heaters.

The paper concludes with statistical data relative to water-heater development by Nottingham and six other undertakings.

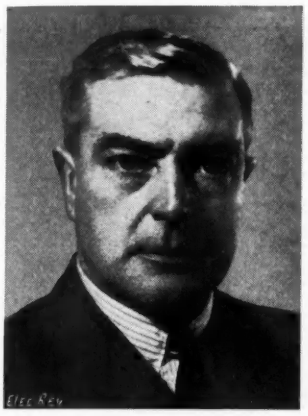
This information is set out in a table which is reproduced herewith.

Summer School of Electrical Housecraft

Following the success of last year's summer school for domestic science teachers, held at Gloucester, the Electrical Association for Women has organised a similar course, to be held from September 24th to 29th, at King's College of Household and Social Science, University of London. Sir John Brooke, vice-chairman of the Electricity Commission, is to open the course, and many other persons well known in the electrical world are to lecture. The fees for the course, including board and residence, will be £3 3s., and full particulars are available from the director, E.A.W., 20, Regent Street, London, S.W.1. Applications must be sent in by June 30th.

Large-scale Cooking

Paper read at the Thursday morning session by Messrs. W. E. Swale and S. C. Hurry



Mr. S. C. Hurry is sales manager to the Jackson Electric Stove Co., Ltd.

IN the course of this paper the authors point out that a few undertakings have been outstanding in their diligent and successful cultivation of a by-no-means easy market. The total consumption for large-scale cooking in the United Kingdom in 1935 was probably still well below 1 per cent. of the total sold for all purposes.

The cooking load is assured of a certain inherent permanency, and the ever-growing tendency to dine away from home is considerably widening the scope for "public" cooking. This load can, by energetic salesmanship, be greatly increased.

Published data are referred to as an indication that the subject has hardly received, from supply authorities at least, the attention that it deserves. Technical publications in various countries prove the unanimity with which large-scale cooking is recognised as an aim worth pursuing. The technique has reached a high standard and appliances of undisputed efficacy are on the market.

Immense Possibilities

The aggregate load in the United Kingdom is already appreciable (75,000 kW, including baking ovens), yet far below what can be obtained in the near future, merely by a determined sales policy. In large cities a potential load (cooking and baking) of 3,000 kW for every 100,000 of the population is a low estimate. It is not considered an over-estimate to state the present potential load of the United Kingdom at a million kW, representing an annual consumption of about 900 million kWh.

The authors' load curves illustrate graphically the characteristics of different types of kitchens, and are such as to make this business well worth while. Accurate data are in process of accumulation, but more attention should be paid to a systematic study of service conditions. The paper contains details of fifty large electric kitchens.

The ratio of maximum demand to connected load varies between 47 and 64 per cent. The value—kWh per annum per kW of connected load—varies between 422 and 1,620; these figures being roughly proportional to the "meals served per person per day." The individual annual load factors vary between 5.2 per cent. (456 equivalent hours of use) and 52.5 per cent. (4,600 equivalent hours of use). These values show clearly that in a large number of cases the usual form of two-part power tariff is unsuitable for cooking installations.

But with a system maximum demand occurring between 4 p.m. and 6 p.m., the annual group load factors (based on maximum demand at time of system peak—coincident maximum demand, as it is often called) are of a high order, ranging from 48 to 76 per cent. It is this fact, in particular, which makes the large-scale cooking load a valuable one from the supply authority's point of view.

In well designed and carefully operated all-electric kitchens serving one standard meal a day consumptions below 0.4 kWh per meal served have been attained (in Germany 0.25 kWh per meal has been reached in a staff kitchen serving from 250 to 300 meals a day). In steam-electric institution kitchens figures below 0.2 kWh per meal are regularly recorded.

The Question of Tariffs

By virtue of the ease of metering and control electricity can compete with cheaper heat sources. Competitive tariffs are justified and appear to be offered by a considerable number of undertakings. The load characteristics justify some reduction below prevailing power tariffs. The authors' analysis of commercial cooking and baking tariffs quoted by forty-four undertakings in North-West England and North Wales show, generally, that for the large kitchen (say, 50-kW connected load and upwards) a tariff of the type known as the "all-in rate for business premises," where the primary charge is based on the lighting demand alone, is likely to give the best results and deserves careful consideration.

An actual tariff of this type is: £12 per kW per annum for the first 5 kW of lighting load connected; £9 per kW per annum for the remaining lighting load; plus 0.666d. per kWh for all kWh metered. With a suitable grading of the primary charge a tariff of this form can be made to suit the requirements of the majority of business premises.

Mr. W. E. Swale, A.M.Inst.C.E., A.M.I.E.E., is with the Manchester Electricity Department

In the case of large works (where, incidentally, a very considerable amount of cooking load is to be obtained) the case can be met by levying the full kW charge of the standard two-part power tariff on the load measured between 4.0 p.m. and 6.0 p.m. only, and giving a reduced kW charge for additional demand made outside those hours.

The basis of economical cooking is the use of apparatus specially designed for a certain purpose and suitably subdivided to meet a set of average conditions. The paper contains a detailed list and block plan of the equipment (both for cooking and food preparation) suggested for a model kitchen to serve 250 luncheons and 250 dinners daily, plus teas, etc.

In the case of a new kitchen the fault of putting in too much plant should be guarded against. A chef will always play for safety and "add a bit for luck." The ideal is to get the food through with the minimum number of cooking appliances in active use.

In dealing with improvements in an old kitchen electricity can deal so much more efficiently with most cooking processes that, in many cases, smaller equipment will suffice. For instance, a boiling-table need not necessarily be based on the equivalent number of existing gas-rings, as alternative self-contained apparatus is more efficient; oven capacity can be smaller because the cooking space is utilised to a greater degree.

Pitfalls to be Avoided

Suggestions by customers that certain appliances might be "converted to electric heating" (such requests are frequently made in connection with hot-cupboards) should, generally speaking, be discouraged. Converted appliances are likely to be unsatisfactory in use and very inefficient.

Far too often a satisfactory lay-out is made impossible because the building is too far advanced by the time the kitchen proper comes up for discussion. Incorrect choice of equipment and faulty lay-out have resulted in unnecessarily difficult operation and high costs; lay-out needs special experience.

Maintenance data are not available for the simple reason (true, though it may be doubted in some quarters) that the costs are so low as to appear not worth separately recording.

The advantages of electricity in the large kitchen are enumerated, and the authors conclude that the main resistance to the idea of large-scale electric cooking is ignorance, for which the supply industry is, in part, itself to blame. One of the major weaknesses in sales psychology is to forget that the layman does not know (and cannot be expected to) as much about electricity as electrical men themselves.

The case must be stated convincingly. For instance, does the person responsible, possibly the architect, realise that in the *Queen Mary* meals are cooked daily for 3,800 people largely by means of 1,500 kW of electrical plant; that in the London Zoo in one week 117,853 electrically cooked luncheons and teas were served; and that one of the largest public health institutions in this country (Runwell Mental Hospital, Essex) is being fitted with 700 kW of electric cooking plant?

In one city of less than a million inhabitants the medical officer of health is responsible for the inspection of 7,815 premises in which food is, or may be, cooked. With such a field the keen salesman can reap a rich harvest.

A closely reasoned argument, and a sound economic proposal, can now be put up for a large variety of cooking schemes. Development depends mainly on putting the case forward at the right time and in the right quarters. It must not be overlooked that those who want to cook food on a large scale are almost invariably already users, actual or potential, of electricity for lighting and power.

Electric Street Lighting

Paper read at the Thursday afternoon session by Messrs. P. J. Robinson and J. N. Waite

Mr. J. N. Waite is city electrical engineer of Hull

Mr. P. J. Robinson is city electrical engineer of Liverpool

THE objects of this paper are to advance reasons why a higher degree of visibility than generally exists at present is desirable on public roads, and to discuss methods of achieving it with different sources of illumination.

It appears to the authors that fundamental changes are taking place, both from the administrative standpoint and in applied technique. It is now being realised that high intensity of light alone does not necessarily mean good visibility.

Hot cathode gaseous-discharge lamps provide better visibility more cheaply and with less intrinsic brightness than any other source. Therefore objection to their use on the score of colour alone (in their present form they are deficient in red rays) betrays a serious lack of proportion.

British, American and French statistics are quoted to show that if first-class visibility were provided by artificial light (and the authors maintain that it can be provided to-day at a relatively small increase of present illumination costs), then the fatal accident rate would decrease to the daytime rate. If the cost of accidents were included in the balance sheet it would show that the community as a whole pays far more for poor lighting than for good.

It seems logical to argue that the proper lighting of public roads is of equal importance to their efficient maintenance, and that if grants towards the construction and maintenance of main through roads are given from national funds, then similar grants should be available for the provision and maintenance of adequate lighting on such roads.

To ensure adequate public lighting the following administrative changes appear to be required: A lighting authority should control a much greater area than at present. The fewer the lighting authorities, the better the chance of achieving uniformity in lighting systems and visibility.

Roads should be classified according to traffic density; the authors suggest that three classes would be sufficient. The minimum standard of lighting on each class of road should be defined, and it should be obligatory on the lighting authority to provide the minimum standard prescribed.

On through roads carrying a high proportion of through traffic, the cost of lighting should be borne in part by national funds. It should be obligatory that the side lights on vehicles should be fitted with diffusing glass to avoid disability glare, and when adequate lighting is provided, vehicles should be prohibited from using headlights in the lighted area. During lighting hours motor vehicles should be prohibited from pulling up or parking on the wrong side of the road.

The Best Light Sources

The factors which govern visibility in public streets under artificial light are discussed, such as relative brightness of background, silhouette vision, and glare from both vehicle and street lamps.

Regarding light sources the authors say that they have failed completely to obtain authoritative data about the overall cost of producing light by high-pressure gas. Such installations are relatively very few indeed and show no sign of becoming more common. It is concluded that the cost of h.p. gas installations is at least equal to that of low-pressure installations.

The authors' tabulated costs of obtaining light from gas and different types and sizes of electric lamps (see table) show clearly the advantages of the discharge type of lamp, which, it is maintained, is bound to become the main source of illumination for public lighting purposes.

The British Standard Specification for street lighting does not require any guarantees for total light output, and the authors regard this omission as a serious defect. They consider that all competing schemes should be required to guarantee the total light output in terms of lumens or mean spherical candle power.

The authors stress their considered opinion that an average price of ½d. per kWh is a reasonable one for most cases (all-night burning), rising to about 1d. per kWh for smaller undertakings, while for large wattage lamps a figure below ¾d. is justified on economic grounds. It is submitted that when all factors are taken into account electricity provides the best and most economical means of public lighting, installation being easier, cheaper and needing less maintenance.

In Liverpool the cost of operating electric lamps has been proved to be 34 per cent. less than that of a gas-lamp installation. Gas burners need unremitting attention, tests having revealed that the diminution of light output due to fouling of the burner alone is of a serious order, ranging up to 63 per cent.

The paper ends with examples and costs of discharge lamp lighting, both sodium and mercury vapour, in Liverpool and Hull.

Among the authors' conclusions are that (as mentioned above) roads in built-up areas should be classified according to traffic density. It is suggested that three classes will suffice (dense, medium and light traffic). A minimum standard of lighting should be defined for each class of road, this definition to include the minimum quantity of light to be provided per unit area of road surface, minimum mounting height, and the maximum permissible ratio of maximum illumination to minimum illumination value on the road surface.

Co-ordination of Areas

The areas of lighting authorities should be extensive and not necessarily limited by municipal boundaries. In adjoining built-up areas there should be intimate co-operation to ensure reasonable uniformity of illumination on the same road.

The community, as a whole, pays more for poor lighting than for good lighting, when the cost of accidents is taken into account. Poor lighting is worse than no lighting at all, and, therefore, money spent on poor lighting is wasted.

Mirror type of directional apparatus should only be employed with light sources of relatively high brightness, when the light source is completely shielded from the normal plane of direct vision. The highest practicable mounting should be employed, and this should not be less than 25 ft. for main roads with heavy traffic, and not less than 15 ft. for side roads with light traffic.

Good lighting is not much more costly than poor lighting, and good lighting, giving adequate visibility for all road conditions, is now available. The new electric-discharge lamp has made a new tool available for the lighting engineer, and warrants the most careful attention of all connected with public lighting.

COST OF GAS AND ELECTRICITY FOR LIGHTING.

FROM N.P.L. TESTS L.P. GAS 500 B.TH.U./CU. FT. GIVES 17.5 M.S.C./CU. FT./HR. GAS PRICE TAKEN AS 2S. 4D. PER 1,000 CU. FT. 4,000 HRS. BURNING.

Size in Watts (Overall).	Mean Spherical Candles (Initial).	Cost of Electricity at 1d. per kWh. for 4,000 hours Burning.	Annual Cost per Mean Spherical Candle Power.	Annual Cost	
				Gas.	Electricity as Fraction of Gas Cost.
		£ s. d.	Pence.		Pence.
ELECTRIC FILAMENT LAMPS.					
100	96	1 13 4	4.17	6.4	.65
200	231	3 6 8	3.47	6.4	.54
300	375	5 0 0	3.20	6.4	.50
500	674	8 6 8	2.97	6.4	.46
750	1,082	12 10 0	2.77	6.4	.43
1,000	1,520	16 13 4	2.63	6.4	.41
ELECTRIC-DISCHARGE MERCURY-VAPOUR LAMPS.					
163	380	2 14 4	1.71	6.4	.27
265	720	4 8 4	1.47	6.4	.23
420	1,430	7 0 0	1.17	6.4	.18
SODIUM LAMPS.					
85	300	1 8 4	1.13	6.4	.17
115	490	1 18 4	0.94	6.4	.15
170	765	2 16 8	0.89	6.4	.14

Note.—The light outputs are based on the initial efficiency. With the filament lamps the average efficiency over 1,000 hours is 93% to 95% of the initial. With mercury discharge lamps over 1,500 hours' burning 82% to 85% and sodium lamps over 2,500 hours' burning 80% to 82%.

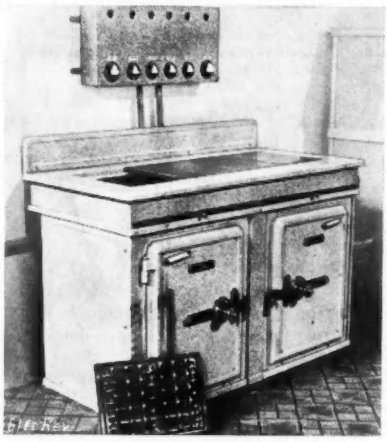
Cooking and Heating Progress

Ideas for the future from the I.M.E.A. Exhibition

From Our Special Commissioner

MOST electrical people find it difficult to draw the line of demarcation between domestic and "commercial" cooking equipment, for probably more depends on construction, particularly of the hot-plates, than on overall size. A fairly accurate presentation of this, however, is to be found in two equipments displayed by the Falkirk Iron Co., Ltd. One is a range with two ovens (16 in. by 18 in. by 16 in., 3,000 W, and 16 in. by 18 in. by 13 in., 2,000 W), a warming cupboard over the smaller oven, a grilling chamber (2,500 W) over the larger oven, and three 1,750-W boiling plates and two 1,150-W plates. The other cooker has two 5-kW ovens and four rectangular plates side by side with a total boiling-plate load of 14 kW, the plates being of the clamped-element construction suitable for long-period working under the eye of the chef. This gentleman's exacting demands should be met in full by the "Chef's" range, introduced by the Jackson Electric Stove Co., Ltd. The hob proper around the central heavily loaded plate is itself equipped with lower-loading elements, so that simmering facilities are readily provided.

I hope that one day something similar may be possible in the domestic field, for ever since Mr. Hoadley's call for quicker boiling I seem to have heard of nothing but higher loadings conjointly with lower loadings or—if you will—quicker boiling and simmering. I am sure the Maidstone engineer thinks of these additional facilities in the terms of lower tariffs. Anyhow, a Metropolitan-Vickers' representative did seriously suggest to me that simmering could only be met with satisfaction to the housewife by partially withdrawing the utensil from the plate to suit the conditions of the moment. But nine out of ten women have done that for years before any engineer thought about it—and on electric cookers.

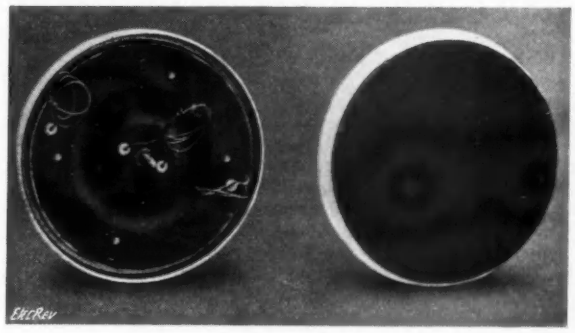


Falkirk 24-kW heavy-duty cooker

Mr. Edinborough (Elexcel, Ltd.) told me that his company is in sympathy with the simmering facility idea, and that a four-heat "radiant" plate is being considered. Arrow Switches, Ltd., said that their four-heat switch was now in really large production, and I learnt that the "external" simmering device of the General Electric Co., Ltd., had made some headway, although it could not be said to have become "generally adopted."

At 3,000 W the improved transformer plate of Messrs. Falk, Stadelmann & Co., Ltd., probably represents the high-load limit of the moment, and the 450-W solid plate on the new pressed-steel cooker, introduced by Tricity Cookers, Ltd., is about the smallest domestic unit to be seen nowadays. The simmering load on the F.S. plate is 300 W. British National Electrics have done something along similar lines, too. The radiant plate on the breakfast cooker has had its loading increased from 1,750 W to 2,050 W for the same area—9 in. by 7 in.

Moffats do not like more than 1,800 W for an 8-in. solid plate, because, they say, distortion is certain if the plate is

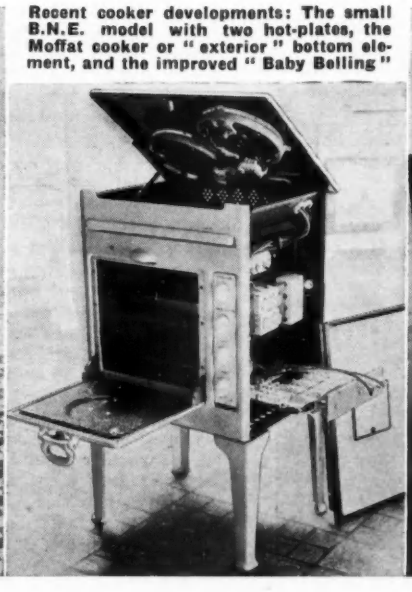


G.E.C. non-creepage boiling plate

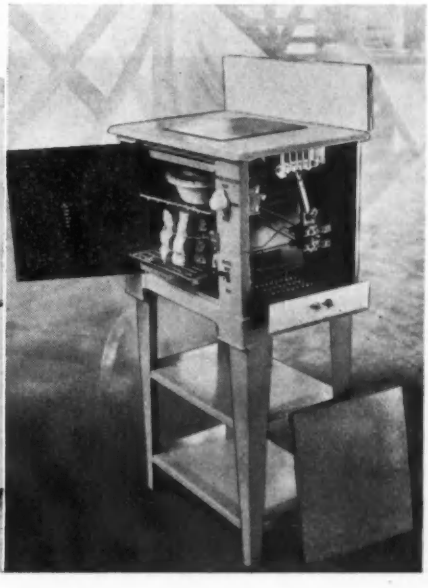
left on without a utensil, and then the plate is no use for the machined-bottom utensil. Hence the recommendation of the "Cookquik" semi-radiant plate. A life-extending idea for hot-plates is being advanced by the G.E.C., who have incorporated a deep groove in the underside of the casting around the edge. Liquid creepage to the refractory can only take place *via* the inner surface of this groove, and the liquid is evaporated before the journey's end. On the high-loading plate (8 in., 2¼ kW) the groove is accommodated in an extension around the bottom of the casting. The hot-plate is to be standardised for 7 and 8 in., but will be extended to other sizes later.

At every I.M.E.A. Exhibition there is a smaller smallest cooker. This year it is a British National Electric. Two independent plates (1,800 W and 1,200 W) an 1,800-W grill (in the oven but not for oven pre-heating) and an oven (10¾ in. by 11¼ in. by 11 in.) loaded at 1,600 W, all within an overall space of 20 in. by 19¾ in. by 13½ in. is, I should say, the last word in compression.

An improved "Baby Belling" represents one of the three extensions of the "exterior" oven elements which I have seen this year, and in common with the Falk, Stadelmann development special measures have been adopted to obtain improved air circulation within the oven. I wonder if the germ of at least one of these moves emanated from the "steam ejection" idea. The 750-W fireclay element unit "covers"



Recent cooker developments: The small B.N.E. model with two hot-plates, the Moffat cooker or "exterior" bottom element, and the improved "Baby Belling"



a large portion of the oven bottom, is located under the fixed oven interior and is withdrawable from the side. There are holes in the bottom of the cooker casing and air is drawn through these, passed through the heater spirals, deflected out through a space under the front bottom lip of the interior, and directed by the door up into the oven.

A new Moffat cooker has an "exterior" bottom element similarly arranged, except that it is almost U-shaped to give a concentration of heat at the front. However, I think the most revolutionary though practical scheme is the F.S. one, with its steatite threaded element units housed in the grooves formed on the outside of the oven interior by the inward projecting shelf runners. By allowing the metal to "breathe," slots under the runners or element projections obviate "chipping" of the enamel, and the sloping bottoms of the projections facilitate air circulation.

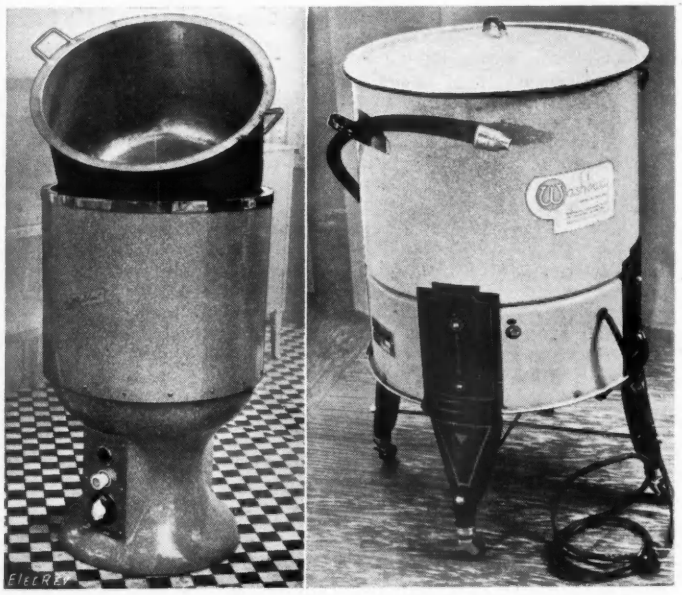
While efforts to reduce overall dimensions and those to increase "utility capacity" within the same dimensions have always seemed much the same thing to me, moves such as that of Moffats to put an extra plate (6½ in.) in its 20-in. by 22½-in. hob prevent me from voicing an opinion too loudly. I saw a new Revo cooker with a 2.05 cu. ft. oven loaded at 1,800 W, a 2.2-kW grill-boiler and a 2-kW, 8-in. hot-plate, and also a new English Electric equipment with a 2.268 cu. ft. oven loaded at 1,800 W, a 2,000-W grill-boiler and a 1,600-W, 8-in. hot-plate. The more favourable oven-space to overall-width ratio which results from locating the switches between the oven and hob is very striking in the new Tricity cooker, and I find it difficult to understand why the idea is not more generally adopted.

I see no sign yet of general agreement on automatic temperature control, and that may be all to the good, but as one impatient to see the advantages of electrical service more fully exploited I wish electrical men would stop talking about "another gadget to go wrong," especially when they ask for a second gadget to give them time control as well. Electrical development owes a tremendous amount to the inherent advantages of *electrical automatic control*. This serious criticism is expressed quite independently of the main issue of hand *versus* automatic control.

Elexcel think that thermostatic control is the thing of the future, and they are going to push it. They are satisfied that with the thermostat in the correct position at the top of the oven no alteration whatever in their cooker design is called for. British National Electrics still see the housewife's food liable to being burnt in her absence without time control, and they think that redesigning the cooker would be necessary if automatic control were adopted. Moffats are still pushing the scheme, of course, and on the stand of Hotpoint Electrical Appliance Co., Ltd., I saw a new range of cookers with thermostatic control, the thermostat in each model being situated at the top of the oven, outside the removable oven interior. Belling & Co. have given up the idea of two-step automatic control in favour of the single-step method.

I feel sure that any move to foster a closer association between electric cooking and water heating in the minds of all concerned is a progressive step. I have in mind the B.N.E. scheme, whereby switching to "high" on the cooker switch automatically switches off the water heater, while at "off," "low," and "medium" the water heater is left "on."

Café-type water-boiler developments include a unit introduced by Santon, Ltd., in which, for one size only, a pilot loading of 250 W maintains a limited quantity of water at practically boiling point, while a boost load of 6-kW (5 gal.) is automatically brought into circuit immediately some water is drawn off. An equipment produced by Messrs. George Green & Co. is designed to afford the same output with a much reduced maximum demand. A 4-kW restaurant boiler (Archibald Low Electrics, Ltd.) has a ball-valve cold-feed cistern on the side with a feed down to a central circulator.



Archibald Low soup boiler and a 10-guinea washing machine (Falk, Stadelmann & Co., Ltd.)

I saw very little new in water-heating equipment proper. This is probably because of the great amount of business that is being done just now by way of conversion work. Perhaps the most important recent major developments are those designed to overcome scaling troubles by indirect transmission of heat. I was told that the scheme of Aidas, Ltd., with its transmission through a special fluid, has definitely solved the problem. Messrs. Archibald Low employ water as the transmission medium in their "Scallak" heater. The horizontal cistern-type heaters introduced by Johnson & Phillips, Ltd., should solve many head-room problems.

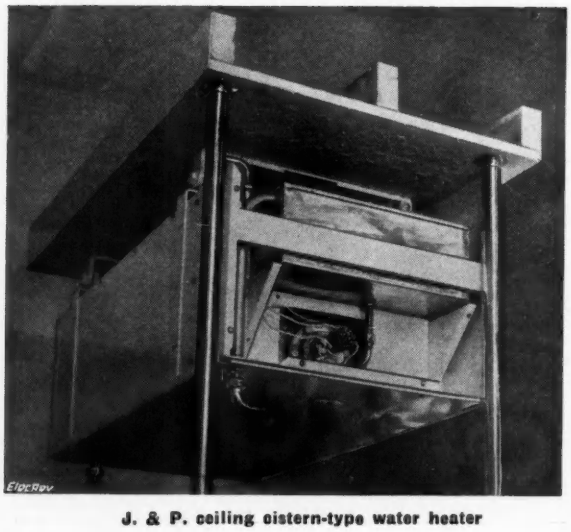
Is heat insulation really wanted for wash-boilers? The Burco and Elexcel equipments, with about ½ in. air space only, and the Revo and Bulpitt one-container wash-boilers suggest a definite change in outlook in this field. A washing machine at ten guineas is to be seen on the Falk, Stadelmann stand.

One of the most progressive lines of thought expressed to me at the Exhibition is the association of lighting with heating. Tubular lamps in the element sockets strike the right note, but I hope the "serious consideration" will lead to something very much wider in scope. A very fine fire effect is produced by Messrs. Greene, Phillips & Co. in some of their convectors.

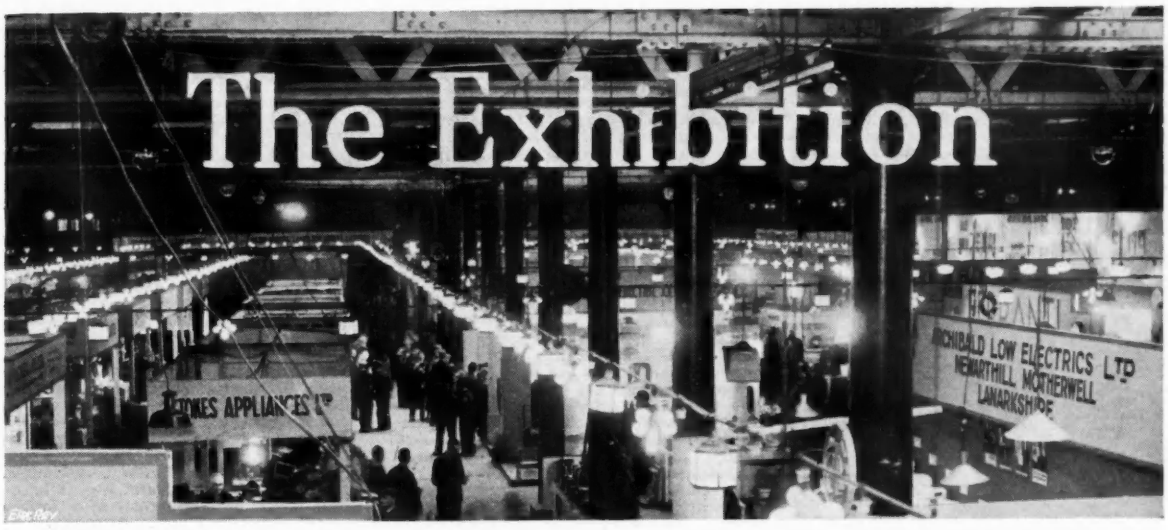
Tubular heaters as convectors is an idea expressed by paybox heaters displayed by Falk, Stadelmann. Short lengths side by side in a suitable housing make an attractive portable unit, but it is the open ends, top and bottom, which give the actual convection. Elexcel have solved the ship's cabin heating problem in a similar way, though without convection.

I have always liked the outlook of Messrs. Ferranti, Ltd., towards space heating, because, for one thing, of their recognition that different heating problems demand different heating systems or combinations of systems. Certainly their latest ideas of providing a system specially for those places where radiant heating is the only possible thing—open-air schools, exhibition halls and book stalls—are sound.

Messrs. A. Reyrolle & Co., Ltd., told me some interesting things about thermal-storage heating. Not only are they tackling building heating in this way with the electric boiler, but a particular promising field is the provision of steam for sterilising milk utensils. Four public baths at Bristol are now warmed in this way. On the stand of Messrs. George Bray & Co., Ltd., I learnt of air-conditioning schemes employing banks of "Chromalox" units with fins in the air ducts.



J. & P. ceiling cistern-type water heater



ALMOST a hundred manufacturers have co-operated to make this year's I.M.E.A. Exhibition, which is being held at the Waverley Market, Edinburgh, by far the most comprehensive yet staged. Practically all last year's exhibitors have stands and there are many important newcomers. In a very large number of cases advantage is being taken of the occasion to introduce new products. As at the National Convention last year, electric vehicles form the subject of a special exhibit comprising some of the latest models together with examples of batteries.

Aidas Electric, Ltd.

In addition to standard "Sadia" storage water heaters there is a new type, which is indirectly heated by a patented method that has been evolved for the purpose of minimising the fur deposited on heating elements immersed in hard water. The system consists of an ordinary immersion heater encased in a large copper sheath, the intervening space being filled with a special compound, or jelly, having for base a mineral oil. This jelly is held in a vacuum and cannot possibly deteriorate in any way. The electric immersion heater imparts its heat to the jelly, which melts and becomes very fluid. An immediate circulation takes place inside the immersion heater, a hot flow rising in the centre and a cooled flow dropping down the side. In this manner the sheath temperature is never more than 10 deg. to 12 deg. F. above the temperature of the water surrounding it. The water, therefore, accepts this gentle heat very readily. A visible hot flow takes place at once and the hot water collects at the top of the water container. When the water temperature is kept very high, viz. 195 deg. F., a certain amount of furring takes place, but the deposit does not adhere to the metal parts of the water heater. It tends to remain in suspension and is evacuated at the next draw off.

One of the advantages of this system is that it reduces the maintenance of hired heaters. With London water it should not be necessary to clean the heaters more than once in five or six years. Another advantage is the safety device made possible by the low surface temperature of the heating immerser, because the thermostat sheath is in direct metallic contact (silver soldered) with it. In the event of the water heater being connected to the electricity mains before it has been filled with water, the thermostat will switch off. Furthermore, there is a large reservoir of heat stored in the heating compound, so that when water has been drawn off the initial rate of heating is much in excess of a similarly loaded element of the ordinary type. A 600-W indirect heating element will provide small quantities of water at 120 deg. F. in the same time as a 750-W element of the ordinary type.

The 1½-gallon heater has a heavy gauge tinned copper water container tested to 100 lb. per sq. in. pressure and tinned by total immersion in pure molten tin, fitted with non-return valve, variable flow restrictor, inlet tap and 9-in. swan-neck outlet spout.

Arrow Electric Switches, Ltd.

Rotary switches for flush and surface mounting are available in sizes of from 3 to 35 A at 250 V, of the single, double, triple and four-pole patterns; and for the first time the complete range is shown with terminals at the back for flush mounting. Side-connected cooker switches of the single and double pole types for three-heat control have undergone a number of changes and improvements. There is also a new four-heat side-connected cooker switch that is interchangeable with three-heat types.

The new "Arrow-Wilcolator" thermostat is of the flexible tube type and is operated by means of liquid bellows. It is interchangeable with the present side-connected cooker switches and switching is accomplished by means of single or double pole silver-butted contacts.

A comprehensive range of starting switches of the quick-make and break type for small fractional h.p. motors used in connection with domestic appliances is shown, and also a wide range of 10-, 20- and 30-A tumbler switches for larger motor control. The new magnetic switches for across the line motor starting are exhibited for the first time, with or without remote control, and are available as contactors or motor starters with thermal overload protection.

There are also interesting motor reversing magnetic switches which are suitable for machines up to 7½ h.p.

Automatic Electric Co., Ltd.

This company's stand is devoted to demonstrating how equipment originally designed for use with "Strowger" centralised street-lighting control can be applied to centralised electric switching for numerous public services. Among such functions is the centralised switching (entirely over the power circuit) of street lamps, water-heating equipment, shop windows and advertising matter, two-tariff meters, street traffic signals, police call signals, and audible alarms for use in national or local emergencies.

Emphasis is laid on the value of the

"Strowger" multi-purpose facility switch (Automatic Electric Co., Ltd.)

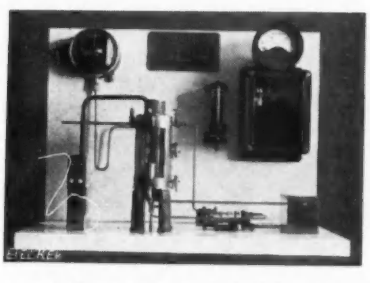
"Strowger" system for centralised control of street lamps as a means of "blacking-out" areas upon the approach of aircraft, an important point in view of the schemes now being considered for the reorganisation of the nation's defences. Equipment for the remote control of electric power stations, incorporating "television" reading of remotely situated metering equipment, is also exhibited.

Automatic Light Controlling Co., Ltd.

This company's range of "Gunfire" electric time switches is of both the hand wound 16-40 day type and the synchronous motor-driven class with solar dials. The Willis world clock, a time-piece fitted in a walnut case of attractive design, enables the exact time in all parts of the world to be seen at a glance. The movements for these clocks, which this company manufactures, can be hand wound or driven by synchronous motors.

Bastian and Allen, Ltd.

Besides a 1.5-gal. domestic type water heater and an electrode circulator of the



A model of a Bastian & Allen steam boiler

pattern designed for building heating and hot-water supply, a low-pressure steam generator is shown, which has been specially devised for sterilising on farms and in dairies. It is designed for operation at any fixed loading up to 20 kW, and a feature is that steam is raised in approximately one minute from the time of switching on, even when the boiler is set for a loading of 10 kW and despite the fact that the container holds some six gallons of cold water. This rapidity of steam production is of great advantage when the demand for steam is intermittent.

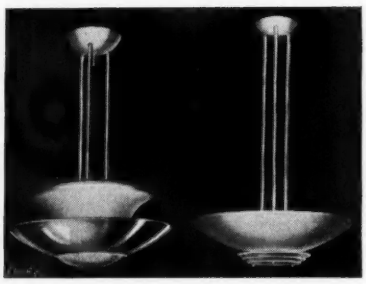
A working model of the Bastian electrode steam boiler (illus.), complete with automatic control and motor-operated pump, is only 9 in. high, and has a glass tube shell through which the electrodes and other features can be seen. All valves are miniatures and a steam pressure of 50 lb. per sq. in. is obtained in a few minutes. The boilers of which this is a model have been installed in this country for large scale catering, brewing, and bottle washing, hospital sterilising, tobacco manufacture, laundry work, and sundry manufacturing processes.

Belling & Co., Ltd.

A full range of cookers includes the "Baby" as well as the standard range as used for hiring purposes, in addition to models fitted with double glass oven doors and also with automatic oven temperature control. The display is completed by breakfast cookers fitted with a plug-in boiler-griller plate, together with a few of the more interesting types of electric fires, particularly of the built-in pattern as used on housing estates.

Berry's Electric, Ltd.

The two main features are "Cold-



Two of the latest Berry's Electric lighting fittings

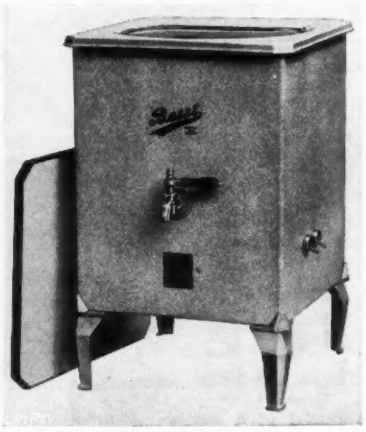
spot" refrigerators and water heaters; among the latter the most recent "Belberry" streamline 1.5-gal. heater is given special prominence. Fires of the "Mistoberry" and "Haloberry" designs are represented, together with selected examples of lighting fittings.

Benjamin Electric, Ltd.

In addition to water heaters, a special display has been arranged to represent industrial artificial lighting. Such commercial illumination as is applied in offices and shop windows is also featured, as well as exterior floodlighting.

"Besst" Electrics, Ltd.

A range of electric washboilers is designed to meet all needs. The square



A de-luxe model wash-boiler ("Besst" Electrics, Ltd.)

de-luxe boiler (illus.) is of pleasing appearance. Most models are available in a range of artistic colourings, easily cleaned. An electrically heated combination washer with hand-operated agitator and wringer with rubber rollers, folds into a small space and incorporates a useful ironing table which forms a cover.

George Bray & Co., Ltd.

A comprehensive range of embedded-type totally enclosed heating elements utilises an 80-20 per cent. nickel-chrome resistor, embedded in a refractory cement, the whole being enclosed in a heat- and corrosion-resisting case. The elements are made up in the form of strips, rings and cartridge elements, enabling them to be used for domestic purposes and industrial applications, where the ultimate temperature does not exceed 1,000 deg. F.

A selection of strip and ring elements, immersion heaters, boiling plates, radiators, and cartridge heaters is available in addition to a selection of refractory insulators, consisting of large and small tubes, rods, firebars, beads, etc.

British Insulated Cables, Ltd.

For demonstrating how power factor can be improved and the a.c. line current reduced by the use of "B.I." condensers, a self-contained a.c./d.c. motor generator set is shunted by a resistance to enable the output to be controlled with a rheostat, so that the a.c. motor can be run at varying loads. An instrument panel indicates the result of switching the condenser into circuit by push button.

The "B.I." rent collector is arranged to accept a definite sum per week and, in the event of non-payment of instalments, will cut off the consumer's supply until the arrears have been made up. The instrument is installed in addition to the ordinary meter, so that when the total fixed charge has all been paid off the redundant collector may be removed from the premises; the two accounts are thus kept quite separate. The instrument may be utilised to collect the fixed portion of a two-part tariff, in addition to any hire-purchase charge. It consists of a standard prepayment mechanism with the addition of a constant-speed self-starting motor drive, all enclosed in a stove-enamelled pressed-steel case. Up to seven coins may be inserted in advance, the number unused being indicated on the dial (black). When the main current is switched off the motor continues to run and the arrears are indicated on the dial (red); a separate dial shows the total number of coins inserted.

Other selected products are joint and fuse boxes, street pillars, overhead fittings for trolley buses and trams, meters, wireless condensers, paper pinions, welders, solders and soldering pastes, copper and wire in various stages of manufacture.

British National Electrics, Ltd.

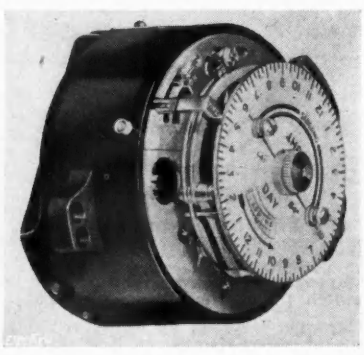
A special switching arrangement has been introduced for operating a cooker oven in conjunction with a water heater, so that the latter is switched off whenever the full oven heat is in use, the water heater circuit being re-established as soon as the oven elements are reduced to medium or low heat. Since the water heater (of associated Archibald Low make) is of the thermal-storage type, and full oven heat is rarely required for more than twenty minutes at a time, the consumer's normal facilities are not interfered with. The combined demand of the two appliances cannot exceed the m.d. of the cooker alone; thus consumption should be increased without raising the potential m.d. of the installation.

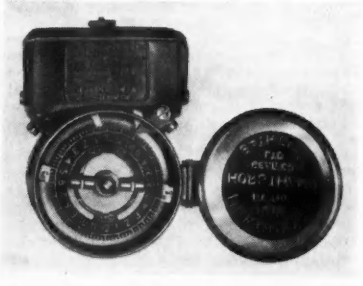
The Type H.D.1 heavy duty cooking range for hotels and resturants is exhibited for the first time. Domestic models are now finished in pastel vitreous enamel colours. Model C.12 (illus. page 861) has an M-V boiling plate and grill-boiler, while the C.11B breakfast cooker now has a loading of 2,050 W instead of the previous maximum of 1,750 W.

Other B.N.E. appliances are fires, irons, toasters, vacuum cleaners, and floor and table lamp standards. There are also "Universal" irons, toasters, percolators, egg cookers, waffle irons, sandwich toasters, hair curlers, heating pads, and clothes washing and ironing machines.

British Sangamo Co., Ltd.

The Type S.S. time switch is an entirely new small synchronous switch of the plug-in type which has been especially developed for individual post mounting, window lighting and heating





Two types of time switch: The Sangamo "S.S." model (cover removed) fitted with solar dial, and the Horstmann Gear Co.'s "Newbridge Type T" (see p. 860)

circuits. It is rated at 10A and is of the single-pole single-throw type. It will plug into any standard post box, and a feature is that the handset dial is interchangeable with the solar dial.

The standard switch is fitted with one "on" and one "off" lever, and it can also be supplied with a daily cut-out. Without a daily cut-out it is available with three "on" and three "off" levers. With a handset dial settings can be made for minimum periods of fifteen minutes between "on" and "off" or "off" and "on" operations. The motor circuit is fused on both sides, the fuses being incorporated in the switch. They may be easily removed, and two spares are stored in the case. Another interesting development is that the switch mechanism is all enclosed in a cover and base of moulded bakelite, provision being made for locking or sealing. The switch mechanism can also be supplied with the base only or without cover and base.

Other "Sangamo" time switches include the Type "S" synchronously controlled model. Type "SW" is similar, but has a spring reserve of 9 to 12 hours which operates the switch only in the case of current failure. Type "W" is an electrically wound switch.

Among the range of electricity meters are the Type H.M. all-insulated single-phase meter, and the latest pattern multi-coin prepayment meter. An improved variable rate fixed charge collector, portable test meters, polyphase meters, test blocks and synchronous motors are also being shown by this company.

British Thomson-Houston Co., Ltd.

Amongst motors one of 3 h.p. represents the latest addition to variable-speed machines. It is a polyphase shunt commutator motor, and operates in conjunction with a separate induction regulator. It lends itself to totally enclosed operation and is also readily adapted to vertical or overhung mounting by an appropriate skirt or endshield. For starting the Type TMC triple-pole contactor with normally open interlock and a triple-pole thermal over-current relay "start" and "stop" push buttons are mounted in a recess in the front cover. Slipring lift motors are built in sizes up to 25 h.p. for intermittent service where quiet operation is essential; as there are no ventilating fans windage noise is reduced to the minimum.

Pumping equipments of 1 to 20 h.p. of the horizontal, squirrel-cage, protected type, have a flanged endshield on to which the pump casing is bolted. The pump impeller is carried direct on the motor shaft. A cast aluminium rotor, and a waterproof terminal box are used with a float switch and direct-on-line starter.

A glass bulb mercury pool rectifier (illus. p. 860), which is entirely of B.T.H. manufacture, is of the six-anode type, suitable for ratings of 400 A at 600 V, or 150 A at 3,000 V. For demonstration purposes a small transformer is provided to operate the bulb with six-phase double-star and interphase connections to give an output of 150 A at 230 V. On closing the transformer supply switch, the ignition unit automatically starts the excitation circuit.

Switchgear exhibits include examples of generating and sub-station, industrial, mining, and rural distribution apparatus; also the latest form of expulsion gap lightning and surge protective equipments for overhead lines. Class BP flameproof horizontal draw-out switchgear for service up to 3,300 V in underground mining is provided with earth leakage and cable terminal boxes permit-

ting rapid cable disconnection underground without decompounding. The 22,000-V rural switchgear exhibit comprises a triple-pole, pole-mounted type HD air-break switch of the tilting insulator type; a single-pole type IQ isolator; and a single-pole type BG expulsion fusible cut-out, in which the rewirable cut-out unit is removable from ground level by means of a pole provided with a locking grip.

British Vacuum Cleaner & Engineering Co., Ltd.

The latest "Goblin Ace" domestic cleaner (illus.) is cylindrical and has solid fibre wheels. The duplex container has a paper bag, which is thrown away when full, in a combined holder and sanitary device. The hose has a swivel coupling, which is insulating, and will not work loose. The three-way agitator nozzle also has a swivel coupling. Noise and vibration are reduced by a system of baffles and the method of suspending the motor and five-stage fan. All electrical circuits are isolated from exposed metal parts. There are insulating bakelite bushes at the inlets, and provision is made for earthing. The storage case has two-tier trays for the accessories.

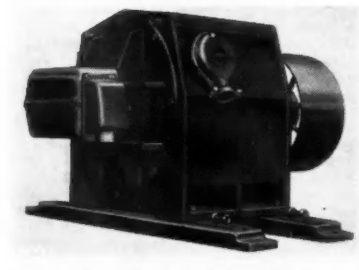
The "Wizard," with an external dust-bag, has an agitator nozzle, and the handle can be removed for single-handed use. The "Ideal" is an upright cylindrical broom-handle type, with a 150-W motor. The "Clean Sweep" and "Triumph" are cylindrical machines on runners. A spraying attachment is

The "Goblin Ace" vacuum cleaner (British Vacuum Cleaner & Engineering Co., Ltd.)

available and also a dog-grooming tool that imparts a massage effect as well as brushing and sucking away loose hairs.

Bruce Peebles & Co., Ltd.

A 1,000-kVA, three-phase, 50-cycle, 6,600-440-V indoor type transformer fitted with ratio tapping units shows the novel



Bruce Peebles steel-clad six-ten type slip-ring induction motor fitted with short-circuiting and brush-lifting gear

method adopted of bringing up all leads to oil level, and the coil clamping arrangements. Another 1,000-kVA transformer, similar but partly erected, shows the short cooling paths, liberal subdivision of windings and sturdy coil supports. A 25-kVA single-phase, 50-cycle, 11,000-240-V outdoor pole-mounting transformer is representative of the wide range, while a transformer high-voltage coil winding machine (similar to many in use at the company's works) ensures the expeditious production of accurately dimensioned windings.

A 65-A glass bulb mercury arc rectifier has a patented bi-metal ignition anode which is automatic and certain in its action; the rectifying bulb is of "Pyrex" glass. A 35-b.h.p. screen-protected a.c. motor has been chosen to represent industrial type machines. One of a new line of self-contained type "steel-clad" a.c. motors, possessing extremely robust features is suitable for the hard service conditions met with in mines, steel works, quarries, etc. A flame-proof a.c. motor and an electro-magnetic separator are also being shown.

Bulpitt & Sons, Ltd.

The "Spee Dee" wash boiler (illus.) is shown for the first time. It is of 10-

The "Spee Dee" wash-boiler (Bulpitt & Sons, Ltd.)

gal. capacity and incorporates an immersion loop element of 3 kW in a tinned copper pan, with a safety device that can be reset from outside without disturbing its position. A feature of importance is the ease with which the element can be changed, since a watertight joint is obtained by means of a single large knurled nut, which only requires to be hand-tight.

The "Swan Easi-grip" iron is a new attempt to avoid wrist fatigue, protection at each end of the moulded bakelite preventing contact with the hot metal supports. A new back rest has been designed, and this iron is available chrome plated or vitreous enamelled in four colours. "Swan" kettles and coffee percolators made of "Pyrex" glass are also on view.

Burnley Components, Ltd.

In the range of "Burco" wash boilers are standard hire and housing scheme models. Type 452 is of 10-gal. size, while there is a combined bath and wash boiler. An 8-gal. size and a 6-gal. collapsible model for small houses are also available. De-luxe boilers are obtainable with vitreous enamel finish. The "Burco" electric porringer is another item.

Cable Covers, Ltd.

Improved "Apex" trough-like protectors for cables laid in the ground are made of earthenware. The special feature is the self-locking formation of the cover, each section interlocking with its fellow so as to resist dislodgment from three directions: upward, sideways and downward. The cover sections link together with a simple movement and require no further fastening or separate link. Circular shapes are available for bends, and the simple method of coupling enables them to be laid at a greater speed.

Callender's Cable and Construction Co., Ltd.

This company's exhibit comprises two

An "Anka" adaptor (Callender's Cable & Construction Co., Ltd.)

items, namely, the "Anka" adaptor (illus.) and the Lunn easy payment box, of which both standard and large models are on view.

Cable Makers' Association

This joint exhibit, prepared by members of the Association, is intended to be generally representative of the various types of cables and accessories used in telephone, light and power installations. They include dry-core telephone cables and rubber-insulated cables with various metallic and non-metallic protective coverings, in single- and multi-core types. Special methods of wiring for houses, both conduit and protected surface wiring systems, are included, with cables insulated with paper or bitumen, armoured and unarmoured, for street mains, factories, and power transmission.

Carron Company

Among this company's group of cookers the new F.1 model, of family size, is specially featured. One of its merits is quick initial heating up, while the net cooking space is claimed to be unequalled in a cooker of its overall size. While the standard finish is mottled grey acid-resisting enamel, the F.1 is also shown in very pleasing tones of self-colour enamels.

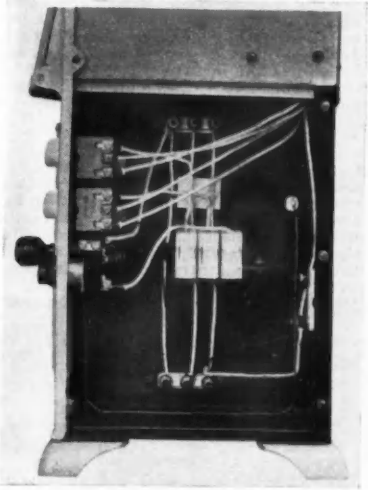
In electric fires there are new and original designs, both of the portable and fixed types. A series of illuminated reflector fires introduce a new note, and screen and pedestal fires will commend themselves with their fresh treatment. Among fires for permanent installation are new designs in the outset type. They are finished in various styles, and, wherever possible, colour has been introduced in which provision has been made for adaptation to decorative schemes. Heavy-duty appliances are also displayed by the company.

Corfield-Sigg, Ltd.

"Crown Merton" utensils for use with electric cookers are made of British aluminium, and the range includes new square stewpans, a milk boiler, a whistling kettle (non-element), a steamer to fit two sizes of pans, a waterless cooker, and preserving and maslin pans. The new "Sunrai" finish retains its original lustre, even after repeated scouring, while all handles are made of heat-resisting, steel-cored bakelite. "Zum" is supplied for cleaning aluminium ware, reflectors and cookers.

"Diamond H" Switches, Ltd.

Apart from three-heat series-parallel cooker switches, a special display is made of "Diathermo" automatic temperature



Side view of oven showing method of mounting "Diathermo" controller ("Diamond H" Switches, Ltd.)

controllers for ovens (illus.); also non-reciprocating rotary switches of all types, capacities and sizes. A new thermostat is provided with a self-contained miniature pilot lamp that glows while the current is "on," an alternative being available without the pilot lamp. Special arrangements are being made to furnish either a scale of degrees Fahrenheit on the bakelite knob of the thermostat, or figures from one to twelve with a very

C

prominent "off" position, the figure scale being similar to that used on the gas "Regulo." Special mounting devices enable this new thermostat to be easily fitted to nearly all existing cookers.

Other recently introduced items are double-pole three-heat series-parallel flush-type cooker switches; single-pole four-heat rotary switches of the flush type for the latest four-heat hotplates; various special multi-circuit switches; and a newly designed wash boiler unit with 15-A switch arranged with entries and cable clips. Flush-type switches are arranged for mounting at the rear of the cooker, and are controlled from the front by means of an extension rod of patented design. Coloured bakelite switch covers are available, together with a new self-indicating device.

Drake & Gorham Wholesale, Ltd.

A feature is made of washing machines with an agitator said to be of new design and a power-driven wringer with 14 in. rollers. The pan is loaded to 3 or 4 kW, with three-heat control, so that the clothes can be boiled. A hand-actuated agitator is obtainable for fitting to the smaller machine, which has a hand wringer and 3 kW loading. Both machines fold up to form an enamelled-top table for kitchen use. "Dragor" wash boilers are made to individual specifications; the coloured finish of the outer case withstands boiling heat.

A patented non-drip device is about to be fitted to "Dragor" and "Densacone" water heaters. The "Zeros" refrigerator is motorless, while the "Sparton" has a compressor with only three moving parts, an automatic de-frosting clock, and shelves on the inside of the doors. A selection of lighting fittings and other domestic appliances is shown.

Eastwoods, Ltd.

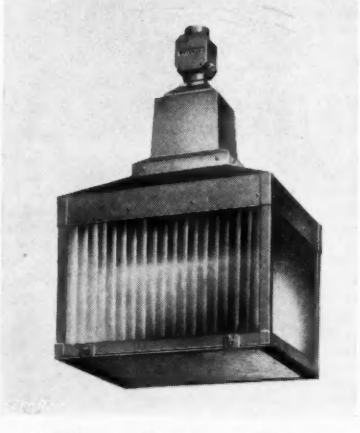
A range of "Sparton" refrigerators is on view from 2.25 cu. ft. capacity upward, d.c. models being obtainable at a small extra cost. There are single- and double-compartment models with a vegetable bin beneath and racks behind the doors. An anti-frost clock is available which serves both as a timepiece and also switches off the refrigerator each night to allow the coils to free themselves from frost deposits. Combination refrigerators with stainless steel sinks and cupboard fittings are also supplied, as well as water heaters.

Edinburgh Corporation

The different types of cookers which may be hired from the Electricity Dept. are on view, together with various kinds of heaters, among them water heaters of the immersion and circulator patterns for top and side entry into existing storage cylinders, as well as self-contained storage water heaters of different sizes. Installation work in connection with the hire-purchase wiring scheme is carried out by selected contractors in accordance with a standard specification.

Edison Swan Electric Co., Ltd.

The "Northbury" street-lighting lantern (illus.) is designed for use not only with the "Royal Ediswan Escura" mercury-vapour electric discharge lamp, but also with ordinary incandescent lamps without the necessity for any modification of the special reflector system embodied in the lantern, which gives full control of the light in both the vertical and horizontal planes, thus ensuring correct distribution for bends and gradients as well as for straight roads. The lantern is constructed of heavy-gauge copper having a cast aluminium silicon alloy canopy complete with special anti-condensation connector box, and will accommodate either a 250-W or 400-W "Escura" discharge lamp or a 300/1,000-W incandescent lamp.



"Ediswan Northbury" lantern

The "Southbury" lantern is intended for side of road mounting only, and it is particularly suitable for erection on existing tramway poles. The "Jubilee" lantern embodies special refractor glasses and inner reflectors, and the fact that the body is completely removable facilitates erection and maintenance. For the illumination of docks, goods yards, sidings, car parks and similar open spaces, and also for industrial interior application the "Wanstead" lantern is now fitted with a heat-resisting, diffusing glass cylinder. A recently improved model of the "Orion" lantern is now constructed in copper and fitted with an anti-condensation box.

Floodlights include the "Sirius H" for horizontal discharge lamps and the lighting of high buildings with small projection; the "Saturn" for ordinary or colour illumination; the "Cygnus" for base or bracket mounting; and the "Mars" and "Juno" projectors. The last-named is used for floodlighting Edinburgh Castle. The "Waltham" is suitable for the lighting of horizontal and vertical surfaces.

"Royal Ediswan" architectural lamps, arranged in the form of letters, are an alternative to the neon sign.

Electric Vehicle Committee of Great Britain

Details of the composite display of battery-propelled vans, accumulators and charging equipment appear on page 869.

Electrical Apparatus Co., Ltd.

In this company's series of house-service meters of the ordinary and prepayment types for single and polyphase circuits the principal group consists of single-phase quarterly and prepayment meters having long-range overload characteristics. They have been designed as a uniform series employing interchangeable parts, the quarterly pattern being obtainable in rust-proof metal or moulded bakelite cases. An important feature is the mounting of the whole of the working parts on a rigid metal plate, which forms a single unit and is removable from the case by withdrawing two screws.

The above-mentioned standard metering element is employed in the range of three dual-coin prepayment meters for single and two-part tariffs. They have the advantage of identical dimensions, fixing centres and position of terminals; in fact, the same bakelite case is used throughout. The single-tariff type EHS embodies a device that permits the rate to be changed in very small steps without disturbing any part of the mechanism, removing the cover, or giving access to the till. An alternative has identical features, except that provision for rate changing is by means of a self-registering wheel bracket. The third meter in the group is arranged for two-part tariff operation, and in this case the universal rate changing device operates on the fixed charge portion of the tariff and collects up to 8s. per week in three ranges, provision being made on the meter for setting the range required.

All the meters in this series are available for operation by shillings and pennies, or by shillings and sixpences, and they reject a wrong-sized coin and return it to the operator. A valuable feature is that any one model may be easily converted to another, and all have a complete rustproof finish.

The various activities of the Association are depicted by four panels showing the demonstrator, teacher, housewife and student at work, and two illustrating the new campaign for home workers which has recently been launched. The three well-known educational charts will also be displayed, together with a picture of the E.A.W. all-electric house at Bristol. Two new charts showing the construction of an electric iron and cooker have just been prepared for use in schools. All the E.A.W. publications will be available, and someone will be constantly in attendance to answer queries.

E.C.A. of Scotland

The stand of the Electrical Contractors' Association of Scotland is equipped as an information bureau, with a staff of attendants to escort visiting members of the public round the show.

Electrical Development Association

The exhibition as a whole has been organised by the E.D.A., on whose own stand is a selection of photographs and reports, together with specimen details of local publicity services.

E.L.M.A. Lighting Service Bureau

The light-sight testing machine, which made its appearance for the first time at last year's convention, is again available; it has made some 21,200 tests at various exhibitions. There is also a display of light meters and charts of pertinent facts related to the science of seeing. Part of the stand is set up to represent a typical demonstration space suitable for small showrooms, while representative examples of street-lighting fittings are in evidence.

Elexcel, Ltd.

The exhibit of this recently formed company, which is associated with the well-known "Xcel" products, comprises several types of cookers, among which is the popular model as supplied to Liverpool Corporation at the rate of 7,000 per year. Fires include the "Xcelcoal" range with its recently developed "fuel" for producing coal-fire effects, and the "Floodlit" series (illus.).

One of the "Xcel" floodlighted fires (Elexcel, Ltd.)

Various types of hot-water storage tanks for domestic and professional use are shown, together with immersion heaters and the patent "Xcel" flange connector for easy fitting. Tubular heaters, domestic trolley hotcupboards, and a wide variety of small household appliances, such as irons, kettles, toasters, complete the display.

English Electric Co., Ltd.

The HC.206A cooker is suitable for families up to eight people and has thermostatic control. The recently introduced HC.209 cooker for the small house or flat is available with or without a stand, and the new HC.212 cooker (illus. p. 864) has thermostatic control. A selection of portable electric fires of 1, 2 and 3 kW sizes includes the reflector type with chromium-plated tubular frames, in addition to coal-effect fires in three different finishes and inset wall-type and mantel surround fires.

Among water heaters of the non-pressure type model the HW.1001 is of special internal construction for districts having hard water. The pressure type HW.20 can be used in conjunction with an existing coal-fired installation or independently. The cistern type HW.5C incorporates a separate self-contained ball-valve tank and is recommended where the cold-water supply cannot be conveniently obtained from the existing feed tank.

The company's washing machine is of square exterior, but the washtub is circular; it is porcelain enamelled and holds 11 gal. of water and 10 lb. of dry clothes. The wringer and the agitator can be used separately or both at the same time. The motor and driving mechanism are enclosed, and one of the

machines shown is fitted with a table top. Besides streamline electric irons, there are "Handidriers" for drying small articles, such as gloves and stockings.

The most recent fuse-gear exhibits are the U.35 units for sub-stations; the "Humburton" metal-clad bus-bar system for factory distribution; a new l.v. fuse fitting (R.D.J.) for pole mounting and ground operating; examples of factory-type distribution boards; "Skeltag" link and fuse gear for sub-stations; combination fuse-switch units; and "Zed" fuse fittings.

"Euk" Manufacturing Co., Ltd.

A two-compartment dish-washing machine is electrically heated. It is made of cast-iron and vitreous enamelled inside and out, the only moving part being a self-contained motor-driven impeller, which is steam tight and removable as a totally enclosed unit. A doughnut machine is electrically heated and thermostatically controlled, the rings of dough being preformed in an overhanging hopper from which they fall into the frying pan. The heating elements are connected through separate fuses and grouped into two circuits. When the fat reaches the desired temperature the main circuit is automatically switched out, while the other maintains the fat at the frying temperature.

A bread-slicing machine is driven by a motor that is automatically switched off when the loaf has been cut up. The rotary blade is cam-shaped and the edge which makes the initial incision is serrated, so that the crust is sawn through, minimising the tendency to crush the loaf. There is also an electric bread wrapper sealing machine, while a multi-slice toaster automatically switches off the current, rings a bell, and shows a red light when the toast is done.

Eureka Vacuum Cleaner Co., Ltd.

This company's vacuum cleaners are entirely British made by Messrs. A. Reyrolle & Co., Ltd., and they have been sold in the British market for over twenty-six years. They are of robust construction, and the floor nozzle, 14½ in. wide, can easily be adjusted for any type of floor surface or covering. The attachments include a sanitiser for moth-proofing, and a polishing attachment for lino and parquet flooring. Every machine is fitted with a radio interference suppressor. Earthed "Eurekas," fitted with 3-core cable, can be supplied from stock without extra charge.

Evershed & Vignoles, Ltd.

This company has specialised in recent years in apparatus for distant indication and control by various methods, which include the Evershed-Midworth distant repeater, the C. & S. no-contact system and the new Evershed-Midworth telemeter. The last-named can be used for the repetition of electrical quantities, steam pressures, steam and water flow, and of any angular movement when the operating forces are weak.

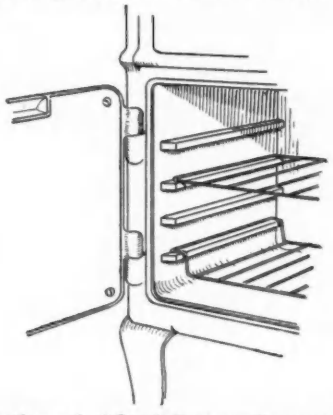
The automatic plumb-bob is an electrical apparatus for indicating or recording accurately the level of water in deep wells or boreholes. Among various "Dionic" electric water purity meters or salinometers are a portable model and also continuously indicating patterns.

A representative selection of "Megger" insulation and resistance measuring and testing sets in their various forms includes the new pocket circuit tester for measuring conductor resistance; it is operated by a flash-lamp battery and is made in several ranges. A high-sensitvity recorder, of the type in which the record is made by tapping through a typewriter ribbon, is designed for studying electrolysis problems, while in conjunction with a series of external shunts it can also be used for measuring currents of any value.

Falk, Stadelmann & Co., Ltd.

This company's most important development is the new "streamline" oven now fitted to its range of domestic cookers. Ten easily removable and interchangeable steatite elements are arranged in horizontal troughs built into the oven walls (illus.). Although this method of housing has in the past had an adverse effect on the vitreous enamel, the patented construction of the "Servis" cooker is said to eliminate all danger, even though the oven be left on and forgotten.

The rectangular troughs, which completely protect the elements from accidental contact, or from liquids during cleaning, act as runners and carry the



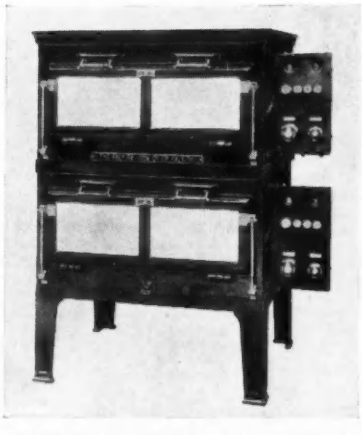
Portion of "Servis" streamline oven, showing built-in rectangular troughs protecting elements and supporting racks (Falk, Stadelmann & Co., Ltd.)

rod racks and drip tin. The elements themselves, formed of steatite sections enclosing a heavy gauge resistor, are removable if necessary from the back of the cooker. It is argued that, owing to the low temperature at which they operate and the complete protection they enjoy, there is little reason to anticipate any need for their removal until the cooker itself requires renovation.

The "Express-Servis" boiling plate's operating speed has been so accelerated that the makers now claim that it is the fastest in the class of transformer-operated plates. Varied ranges of the well-known "Efesca-Servis" fires and labour-saving appliances are also exhibited.

Falkirk Iron Co., Ltd.

This concern's exhibits are divided into two sections, representing household appliances and heavy-duty kitchen equipment. The full range of domestic cookers is represented, from the smallest No. 5359 model for two to four persons to the double oven No. 5306 cooker capable of serving from 20 to 25 persons. There are also breakfast cookers and selected examples of wall and panel fires, portable radiators and irons. The heavy-duty cooking equipment shown consists of a



Two-tier pastry oven (Falkirk Iron Co., Ltd.)

two-pan fish fryer, a single-compartment griller, a double-oven range, and a two-tier pastry oven (illus.).

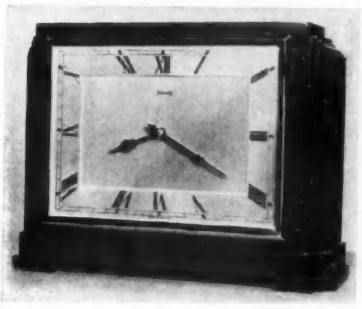
Ferranti, Ltd.

A wide range of fires, from the smallest "Minera" of 600 W to the largest of 2½ kW, is available in a variety of types for portable and fixed use. The "Flamera" has an imitation flickering coal effect, and special attention is drawn to a wall-type fire for open-air schools and other places where air heating is of no avail and radiant flood heating solves a difficult problem.

Besides a working model of a 1½-gal. thermal storage unit in glass to show the interior details, there is a 1½-gal. heater of special type for hairdressing saloons with loading for quick heat recovery. For the conversion of existing hot water systems there are both immersion heaters of the horizontal type and vertical circulators. The "Thermolator" is a circulator with thermostatic control and an "Adjustostat," which enables the consumer to control the water temperature between predetermined limits.

There are synchronous clocks for mantelpiece use (illus.) and also for ceiling and wall mounting, as well as all-weather clocks for outdoor use. All this company's radio receivers are now provided with means for short-wave reception.

The latest developments in meters include two-part tariff and multi-coin types. In a small transformer section is a safe load indicator, a miniature working model of the moving coil regulator, a

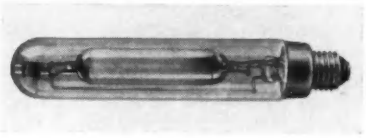


A Ferranti clock

1,500-V standard d.c. test set, a synchronous motor time switch in weatherproof case, a maximum demand alarm relay, a photo-electric counting device, and a triple-pole a.c. overcurrent relay with adjustable inverse and definite minimum time characteristic.

General Electric Co., Ltd.

This company's display is concerned with street and industrial lighting, internal illumination, cooking, refrigera-



New G.E.C. 150-W "Osira" electric discharge lamp for low-mounting heights in factories and workshops

tion and all forms of domestic heating. Next to "Coldair" refrigerators are "Magnet" water heaters of the non-pressure and cylindrical and rectangular cistern types, with immersion heaters, thermostats, and an internal circulator. In the cooking section are electric thermal storage cookers and hotplates.

In one of the end bays of the stand street lighting fittings of all types for "Osira" and gas-filled lamps are staged with a special display of the "Osram" type B lamps, fittings for use in industrial establishments, and examples of exterior colour floodlighting. Architectural lamps are extensively employed both to decorate and to illuminate the stand. In the central reception office are a selection of pendants and a display of the "study" lamp. Prominent places are given to the new G.E.C. electric cleaner, washboilers and portable and inset fires.

George Green & Co.

The "Rockit" electric kettle has a tilting plug ejector, and is guarded against boiling dry, as are also the company's hospital sterilisers. In addition to "Gee-Gee" immersion heaters and elements there are domestic storage water heaters, wash boilers, canteen and café water boilers, tubular heaters, hot water radiators, warming plates, soldering irons, and bed warmers.

Greene, Phillips

These patentees and manufacturers of the "P.H." brand of convector have produced a new model specially for this exhibition.

Hague & McKenzie, Ltd.

Among a display of aluminium uten-

sils designed particularly for use on electric cookers and hot plates this company exhibited a new "Pyramid" toaster and a new kettle.

Harcourts, Ltd.

In addition to a comprehensive selection of standard and popular designs, this company is showing an entirely new range of suspension and ceiling-type lighting fittings, a special feature of which is the introduction of coloured mirrored glass ceiling plates with etched concentric bands, in conjunction with metalwork in satin-silver finish. One example comprises a satin-finished silver 18 in. diameter indirect type bowl suspension unit, which incorporates a 9 in. diameter amber mirrored ceiling plate, the suspension arrangement from the ceiling plate to the metal body of the fitting consisting of four vertical clusters, each cluster formed by groups of three 21 in. long amber glass tubes. The fitting is designed to take a 300-W lamp. Other items of special interest are an original design of a floor lamp and heat unit combination, and a novel lighting design consisting of an illuminated parrot in a gilt suspended cage, a replica of a fitting in the *Queen Mary*.

There are also examples of the patent "Heatlite" suspension fitting introduced last year, and a full and complete range of "X-ray" shop-window reflectors, "Mirolux" trough reflectors for church lighting installations, "Harcorlite" cornice lighting strip and "Corbelux" cornice strip.

Harland Engineering Co., Ltd.

The latest development in metal cladding is "HI-VE" switchgear, so called from the initial letters of the descriptive words "horizontal isolation, vertical examination." Typical examples are a 400-A single-bus-bar ring-main unit (illus.), available in extensible and non-extensible patterns, and a 400-A duplicate bus-bar unit for building up into multi-panel switchboards.

Other exhibits are "Spiroglide" multi- and single-stage pumps, the latter coupled to a Harland 12.5-h.p. squirrel-cage motor and mounted on a fabricated steel baseplate; a "Duoglide" two-stage pump, a "Monoglide" single-stage axial entry pump and a scale model of a Harland bore-hole pump.

L. G. Hawkins & Co., Ltd.

The attachments for the streamline vacuum cleaner include a spraying device. There are fresh models of the "Sunray" heater and a new British-made "Supreme" toaster, electrically heated pillows, and four new washing machines with wringers, together with modern lighting fittings and other appliances for the home.

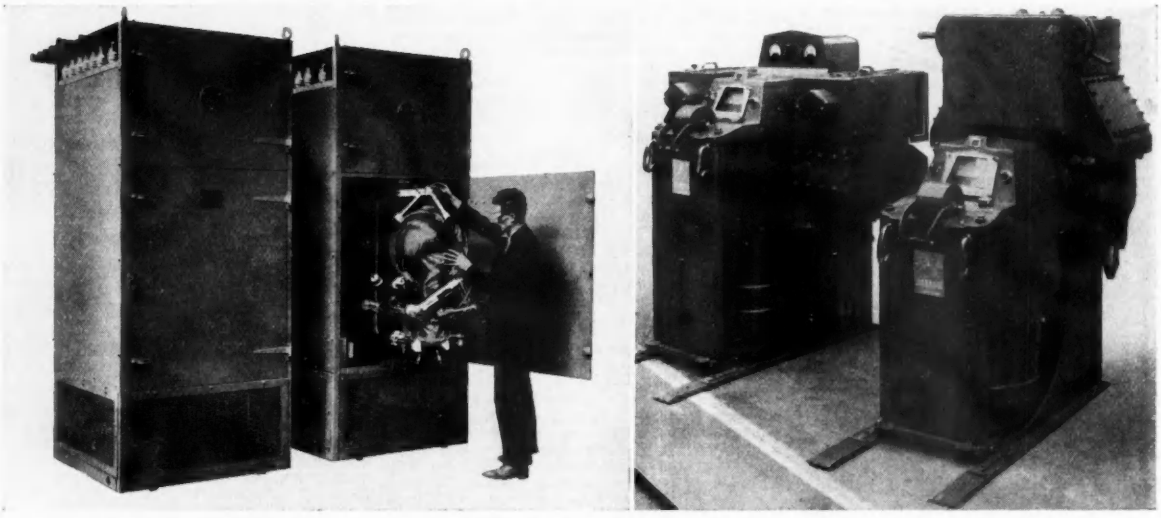
Heatrae, Ltd.

This company shows a very complete range of electric water heaters for various working conditions, and also demonstrates how the various types can be connected up to the best advantage. A variety of pipe fittings is designed to facilitate water connections, and a working model is typical of many sent out to customers for showroom display. Two types specially designed for hairdressers are connected up with pipework to show the complete installation.

Auto-circulators are in two classes: one with enclosed thermostat, and the other with an exposed scale thermostat for external regulation. An item of particular interest is an immersion heater made for railway work, for a working pressure of 700 V to earth, the test pressure being 3,000 V. The exhibit also includes a new combined towel rail and air warmer for the bathroom; a group of warming plates and radiant fires.

H.M.V. Household Appliances, Ltd.

Apart from a clothes iron, with the various parts of its thermostatic control demonstrated, this concern exhibits refrigerators only. "Exploded" parts of a "Marathon" illustrate its method of operation, and a coloured porcelain model indicates the trend of functional design, attention being also directed to the precision with which the mechanism of the "silent" circulator is constructed.



B.T.H. glass bulb mercury pool rectifier and (right) Harland "HI-VE" 400-A single-bus-bar ring-main extensible units

Holophane, Ltd.

A display of street lighting fittings covers all types at present in use for electric discharge or gas-filled lamps. The chromium-plated spun copper lantern 564/2/4114 for 250- and 400-W mercury-type discharge lamps has a two-piece smooth refractor for a two-way non-axial light distribution.

Horizontal burning sodium discharge lamps are catered for by two refractor plate lanterns; the smaller, for use with 50- or 70-W lamps, has a body of cast aluminium with easily detachable top for cleaning the side refractor plates, which are sealed together, thus protecting the prisms and ensuring a smooth outer surface. The fixing is by means of a cast-iron junction box at one end. For 100- and 150-W lamps a duplicate lantern has been designed. "Duo Dome" refractors with all-smooth exteriors now include twelve different sizes and types.

Besides the symmetrical ornamental pedestal refractor for promenades, squares and parks, a quarter reflecting type is also available which gives an asymmetrical distribution. The new "Lennox" lantern (illus.) is also a decorative type for use on a pedestal post in gardens in 100-150-W and 300-W sizes with band refractors, symmetrical and asymmetrical.

Among floodlights in various types from 100-1,500 W, the long-range F.L.1000 now has several new improvements, among which is a pre-setting device; the use of different lens fronts increases its usefulness. The H.F.1000 makes use of a series of flat prismatic reflecting plates for wide spread illumination where the mounting position is near the objective. The M.F.3 is a trough with separate compartments which can be used for colour floodlighting. The exterior "Extensolite" trough with two and four lamps is adaptable for small posters, facias, &c., by adjusting the reflectors.

The Holophane "Lennox" lantern

Two new F.635 and F.636 special prismatic circular bulkheads are shown for the first time. The flameproof F.620 fitting is of special interest to users of pulverised fuel. Lumeters and photometers are a speciality, while prismatic glassware and the new "Controlens" and "Hedralite" plates are attracting much attention.

Hoover, Ltd.

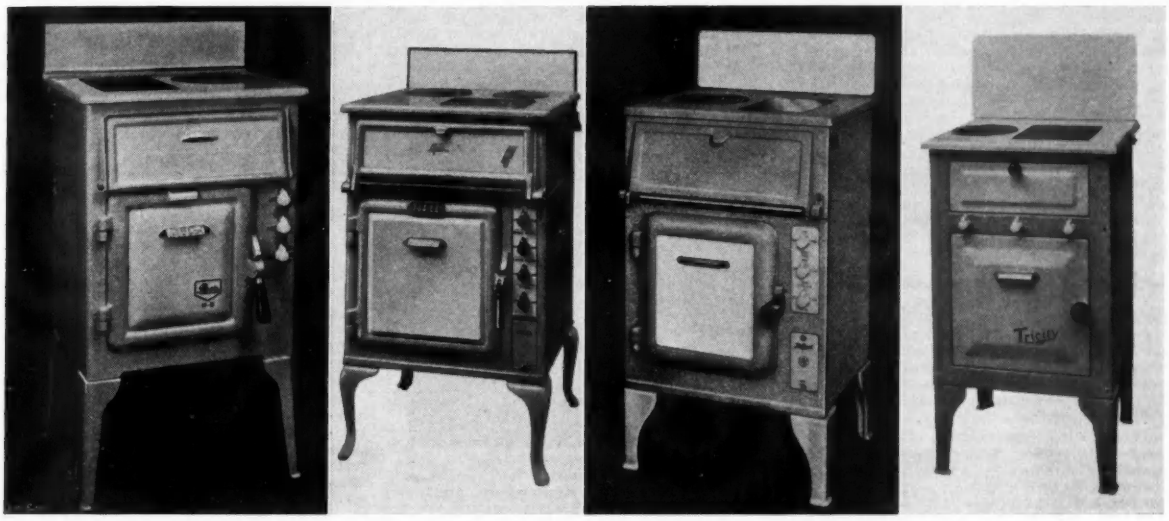
The "Junior" vacuum cleaner is built on the traditional principle of beating, sweeping and cleaning the carpet at the same time. The de luxe Model 825 is streamlined and has a headlighted dirt finder, with a two-speed motor for light and heavy work. For hotels, &c., there is Model 925, with a special clutch which disengages the motor from the agitator should any extra large obstacle be accidentally picked up. The "Dustette" hand machine weighs less than a flat iron.

Horstmann Gear Co., Ltd.

"Newbridge" time switches for street lighting, shop windows and signs, change-over type for multi-tariff metering and other time-control requirements are available with 15- 21- or 40/42-day hand-wound movements, or electrically wound with five days' reserve spring. Hand-set or solar dials, the latter fitted with longitudinal adjustment, are provided. The self-starting synchronous motor-driven models and the electrically wound models are designed for use on a.c. single-phase, two-wire, 200/250-V, 50-cycle circuits. With the solar dial any required lighting or extinguishing schedule can be followed. The standard type "T" 5-A a.c. or d.c. single-pole time switch (illus. p. 856) can be fitted with 15- or 21-day hand-wound clockwork movements housed in rust-proofed extended steel drums provided with hinged cover, thus being adequately protected against the effects of condensation and the presence of ground-damp inside the columns. Type U/V is suitable for housing inside the bases of lamp columns.

Hotpoint Electric Appliance Co., Ltd.

A range of three cookers for 2-5, 4-6 and 6-8 persons (illus.), is being shown for the first time with oven elements, cular flex cord grip. There are also block ceiling roses with automatic cord grip and B.S.S. quality porcelain interiors as a safeguard against surface creepage; such as automatic on-load transformer tap-changing equipment (illus.), consisting of two sections; the tap-changing switch complete in itself for manually



Four of the latest cookers: The Revo "R.8," the B.N.E. "C.12," the Hotpoint "5011T," and the Tricity "777"

boiling plates and grill-boilers, which are interchangeable. "Torribar" boiling plates are provided as standard, but solid plates can be furnished if desired. The smallest model has a 1,600-W radiant boiling plate and a 1,900-W grill of the plug-in type, and the grill warming chamber extends the full width of the cooker, being fitted with a door and white vitreous enamelled crown plate. The 1,750-W oven has side and bottom heating elements and a one-piece removable interior. All the heating elements are arranged for three-heat control, the switches being at the front, while the fuses are accessible by removing a protecting plate at the front of the cooker.

Other items are vacuum cleaners, washing machines, toasters, irons, kettles, fires and immersion water heaters and circulators fitted with "Torribar" heaters. The advantage of this type of element is that the temperature at the surface is approximately as great as that at the core. This has the double effect of permitting the core heat to reach the liquid in the minimum of time, while making it impossible for the element to burn out, oxidise, or overheat as long as it is covered with water.

Hurley Machine Co. (England), Ltd.

The latest "Thor" clothes' washer has a "Rigidspan" chassis, to reduce misalignment and vibration. The four-legged base carries an electrically welded and riveted pan in which is a six-vaned agitator. The finish is dappled green vitreous enamel. The mechanism is totally enclosed, with oil-splash lubrication, and the ¼-h.p. motor drives direct through flexible couplings. A water pump is available as an extra. The plated wringer is adjustable and removable for the substitution of a power ironer.

The cabinet ironer (illus. p. 861) is finished in white and green with an enamelled top. The chromium-plate shoe is self-aligning and heated by a 1,150-W element, with switch control. It is moved into and out of contact with the roll by pressing the knee against a lever under the table; thus the hands are quite free. The roll is directly driven by a ¼-h.p. motor, the mechanism being totally enclosed. An emergency handle releases the shoe from the roll in the event of the motor stopping. Another handle keeps the roll stationary for pressing.

Victor H. Iddon, Ltd.

These specialists in moulded white and brown bakelite lampholders have a new "non-turn" (locked) pattern combining a quick-wired cord grip cap and a locking union ring by means of which the bayonet-slotted sleeve as well as the cap are definitely prevented from being accidentally unscrewed when the shade ring, or badly fitting lamp or adaptor, are withdrawn.

Attention is drawn to a commercial H.O. type with a ventilated skirt and a circ- hand inspection lamps with and without switches and reflectors, the wire guards of which cannot make contact with live parts; bakelite suspension switches in bright colours, and other accessories.

Jackson Electric Stove Co., Ltd.

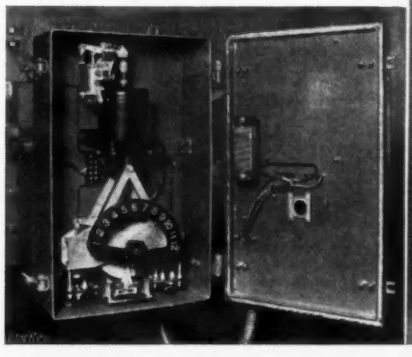
A range of domestic electric cookers includes the "90" series, among them being the two latest models, the Nos. 92J and 93J, in mottled grey vitreous enamelled finish, with some examples in coloured enamel finishes. All the elements throughout this range are of the plug-in type, and it is noteworthy that "90" series cooker elements supplied to-day are interchangeable with those supplied with the original models over four years ago. In the No. 90 series the elements plug into the sides, thus leaving the floor of the oven free, ensuring larger cooking capacities.

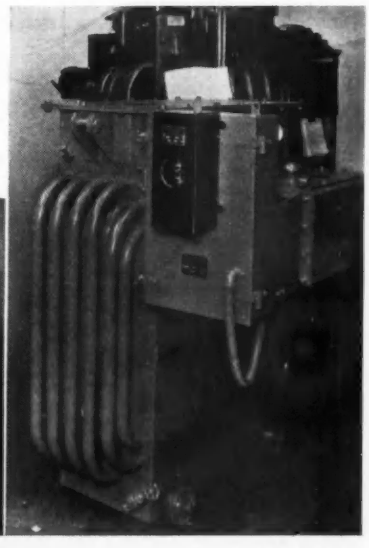
A complete range of 1-, 2- and 3-kW electric fires in various vitreous enamelled finishes, includes light cast fires, portable reflector types, and inset fires, the latter being suitable for building into tiled surrounds in new or existing houses. Thermal storage water heaters conform generally with the E.D.A. Water Heating Committee's recommendations.

Besides the standard cylindrical-type wash-boiler, the latest model has a square outer casing finished in mottled grey vitreous enamel with a loose white lid which acts as a very useful table top in the kitchen. Several examples of large electric cooking apparatus are on view.

Johnson & Phillips, Ltd.

On this company's stand are examples of the "Charlton" water heaters only. They include storage, circulator and im-





J. & P. automatic indoor-type on-load tap-changing equipment shown (right) fitted to side of transformer

mersion types, and a ceiling cistern pattern, for use in blocks of flats.

Cables and accessories are represented on the C.M.A. stand, while in addition an "outside" showroom (99, Hanover Street) has been used to display transmission and distribution equipment, factor correction, and glass-fronted condenser tanks allow easy inspection of manufacturing details.

operated control at the transformer, plus automatic mechanism used for remote push-button control and, with the addition of a relay, for automatically increasing or decreasing the transformer output voltage as it fluctuates with the load. A line drop compensating device can be incorporated in order to maintain a steady voltage at the far end of the feeder, rather than at the transformer terminals. A complete safety device is incorporated to ensure the correct sequence of tap changes.

Drop-down gear and draw-out truck-type switches provide an opportunity of comparing both methods of sub-station control. The "E.K.C." pole-mounting oil-circuit breaker, with auto-reclose mechanism, and the 33-kV, 11-kV and 660-V drop-out "D" fuses will interest those who operate overhead lines. The "S.R." vertical pattern l.v. pole-mounting switch suggests convenient switching at junction "H" poles. An actual 132,000-V suspension insulator string, as now being used by the company in the Central England Scheme, can be examined. Static condensers actually demonstrate the saving in current consumption that can be effected by power-

J. P. Tubular Heater Co., Ltd.

Tubular heaters of this make are available in both rigid and flexible forms,

and have been adapted to all sorts of large buildings as well as dwelling houses, steamships and tram cars. The element is encased within a steel tube and supported by a patented structure composed of rustless steel spring on which are threaded insulators and mica discs, the latter spaced at adequate intervals for supporting the element, which runs the whole length of the tube. Suitable end caps provide for wiring and earthing connections.

The "J.P." convector heater provides a pleasing illuminated effect visible through grilles, while the flexible immersion heaters have a low surface loading which reduces furring and scaling troubles in hard water districts; they are made to dissipate from 2 to 6 W per sq. in. according to size.

Archibald Low Electrics, Ltd.

"Highlow" water heaters for domestic use include thermal storage types in sizes of from 1.5 to 30 gal. The "Scallak" is specially designed for hard water districts, while circulators are made for fitting through the top or side of the tank as well as an external type. The latest pattern is a two-element circulator with constant and booster heaters operated by a special switch marked "normal," "bath," and "off." Other items are automatic water boilers, immersion heaters of all descriptions and a combined cooker and water heater; also milk and coffee urns, soup boiler, griller and toaster, hot cupboard, horizontal steriliser, electric hot-water radiators, tubular heaters and thermostats.

MacGregor & McCallum, Ltd.

These distributors of the "Magic" vacuum cup electric washer have introduced a new gyrator washer to be known as the "Mayfair." This model incorporates a number of detailed improvements, including a new type of wringer, die-cast belt pulleys, and an improved porcelain enamel finish to the "Armco" iron tub. The gyrator blades draw water down to the bottom of the tub and then outward to the sides, thus promoting circular motion which keeps the clothes to the outside of the tub and away from the moving blades. A pump driven by the motor is supplied at a small extra charge for emptying the tub after use.

The "Magic" vacuum cup machine washes clothes by pressure and suction. Three inverted cups, each provided with individual spring action to compensate for uneven height of clothes, move forward a little with each upward movement, so that at each downward stroke of the cups fall on a different portion of the wash. All motion is in one plane, continuously in one direction, thus eliminating strain on the ¼-h.p. motor, which also drives the reversible electric wringer. The "Filordrain," a neat and simple device for filling the tub and draining it after use, is also available. The wringer post ironer fits in place of the wringer, and can be held stationary for pressing. The loading is 1,150 W.

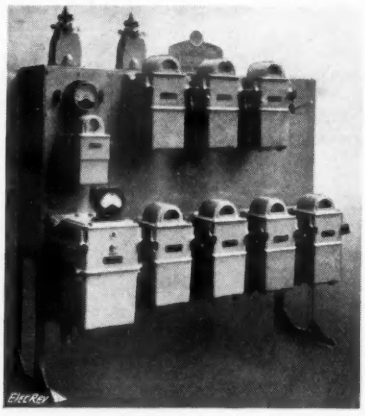
Donald Macpherson & Co., Ltd.

This company's display consists of heating and cooking apparatus finished in the latest "higher heat-resisting" oriental "Foochow" lacquer, together with a series of high-voltage bushings demonstrating a new aged synthetic weather-proof finish. The process involved is claimed to enable savings in labour and cost of materials.

M. & C. Switchgear, Ltd.

Here is a display of metal-clad oil-immersed switchgear for from 30 to 1,200 A (illus.). Type D.170 for up to 660 V is single break (one per phase), special features being total enclosure and total immersion, all coils being under oil. At present this switch is available in 60 and 100 A sizes, and designed for adaptation as a straight-on starter. For larger capacities there is type D.141, double break (two simultaneously per phase) in sizes from 100 to 800 A up to 660 V, either as individual circuit-breakers or combined as switchboards. The stationary contacts are of special form and the loose handle cannot be held in against the auto-releases; the 800 to 1,600 A sizes are made only in the draw-out form.

Type D.141.H is of generally similar construction, but is made for up to 3,300 V of the draw-out pattern. The top chambers are compound filled, but the low-voltage leads and small wiring are accessible in free ducts. Type A.257 single-break oil-circuit breaker for 30 A at 660 V will be found compact in distribution service for mounting on a



Sub-station switchboard for a large creamery (M. & C. Switchgear, Ltd.)

wall. Features are incorporated that make it specially suitable for controlling squirrel-cage motors arranged for straight-on starting, provided the stand-still current does not exceed 100 A. Total enclosure prevents unauthorised interference with the automatic trips, and affords protection from deleterious atmospheres.

Type A.312 is an a.c. star-delta starter (not over 120 A) arranged for push-button operation, and is available either totally enclosed, hoseproof, or flameproof for installation where explosive vapours or dust prevail.

Measurement, Ltd.

The well-known "Type Z" quarterly pattern single-phase a.c. watt-hour meter is obtainable in pressed metal or moulded bakelite cases. The latest all-bakelite cased prepayment instrument is available for a.c. and d.c. circuits. It can be supplied for triple, dual or single coin insertion, and can easily be converted from one to the other by the removal or addition of the appropriate coin-selector arms. This meter, whether supplied for a.c. or d.c., has been designed to incorporate a step-rate unit, and the a.c. prepayment meter is also designed to take a fixed charge collector synchronous motor unit, either of which can be easily added to the existing mechanism.

Apart from standard ordinary prepayment meters, there are complete step-rate and complete two-part tariff prepayment instruments. A feature of the last-mentioned is the very low total watt loss, which has been rendered possible by specially designing the synchronous motor that is used for the fixed charge collector; also testing and alteration of adjustments have been rendered as simple as possible. The amount of fixed charge can be varied within the very wide limits of from 1d. to £1 per week in steps of ½d., and this change can be effected on site without any tools or even the use of a screwdriver. Access to two knobs for varying the fixed charge is gained through a window in the cover of the meter, which is sealed after effecting the requisite adjustment.

In addition, samples of d.c. quarterly type HM and also polyphase three- and four-wire meters are on view.

Metropolitan-Vickers Electrical Co., Ltd.

Motors shown include typical fractional horse-power sizes, models of 10 and 50 h.p., and a 20-h.p. machine of the latest totally enclosed flameproof construction. The latest type of G.P. 11-kV automatic reclose oil circuit breaker is for pole-mounting. A complete K.O.B. three-phase semi-compound filled horizontal draw-out metal-clad equipment is for 11,000 V, and for 3,300 V there is an S.F.1 oil break mining switch-pillar certified at Buxton. Industrial control gear is represented by the L.C.250 liquid controller and reversing contactor equipment, which is operated by extended lever gear. A model shows the operation of the type L.D.S. on-load tap-changer, and two further exhibits are the type L.F. voltage regulator and a two-step booster.

A very comprehensive range of instruments, meters and relays serve to show that practically every form of measuring and indicating device is included in the "Metrovick" range. Particular attention is drawn to the latest type N.E. load rate meter, the "Telemeter" remote indicator, the new range of type F.C. induction instruments, and the laboratory type sub-standard instruments.

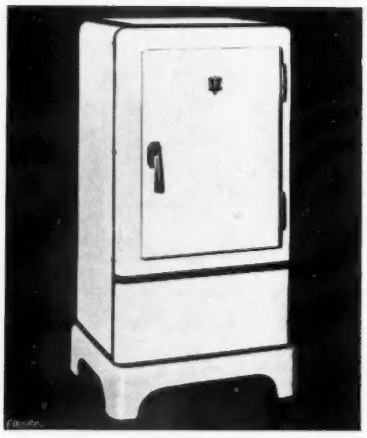
The radiant boiling plate's practical advantages of speed and safety are demonstrated. Examples of "Traffolyte" material are shown, both as lettered boards and coloured panels, and wood veneers are also included in this exhibit, which represents one of the latest developments in modern plastics.

"Cosmos" lamps are on a separate stand with small sign lamps in "Fairyland" strip and "Decora" lamps for architectural striplighting. Discharge lamps include the new 150-W size.

Moffats, Ltd.

The M.32 refrigerator (illus.), just introduced, is very similar to, but smaller than, the two existing models. It is available in two colours and is of streamline appearance, with full porcelain enamel interior and exterior. "Dryzero" insulation is used throughout and the same compressor has been standardised for all three sizes.

The M.22 cooker is available with "Therm-o-matic" control. The balanced heat oven has a system of air circulation designed to promote even baking, no matter in which position the food happens to be placed. The bottom element is completely outside the oven. An oven side vent is provided and a pressed-steel door, the hob being



The "M.32" refrigerator (Moffats, Ltd.)

equipped with two of the latest "Cookquick" semi-radiant boiling plates. The M.21 is very similar and all parts are interchangeable, with the exception of the tops and switch panels, since M.21 has one boiling plate only. Both are available in colours.

A new de luxe baking oven has counter-balanced doors of the full width of the interior compartments; they are insulated and provided with glass peepholes. A stainless steel front is fitted, and the door frame is of porcelain enamelled cast iron. The interior compartments are illuminated and "Ther-o-matic" heat control is available as an extra. The indicators are placed on top and the switches at the side. The interiors are porcelain enamelled with a porcelained brick bottom, each compartment (one above the other) operating independently. Each compartment has two elements which may be removed on guides through the front without disturbing the fire-brick bottom, yet have metal-to-metal connections. Top elements range from 1.75 to 2.5 kW and bottom from 3.5 to 5 kW, according to size. A steam inlet can be provided as an extra for certain kinds of baking.

Parmiter, Hope & Sugden, Ltd.

These manufacturers of the well-known "Aeroflex" fuse are exhibiting a comprehensive range of service cut-outs, in capacities from 30 A upwards. For ordinary house service requirements these can be of the all-insulated type

with bakelite moulded fuse units and insulated sealing boxes, or with insulated fuse units coupled to cast-iron multi-core sealing chambers. They are supplied for looping-out both of the incoming feeder and outgoing circuit cables, and, in addition, multi-way fuse units are available for two rate and multi-meter supplies. These cut-outs can be obtained in all ironclad cases for 400-V three-phase power services for indoor and outdoor mounting, pole or wall type.

In addition, a range of fuse-switches and switches to suit all types of services and circuit requirements, in capacities from 60 to 600 A, are exhibited for the first time. While suitable for individual use for all purposes, they can be combined to form multi-way ironclad switchboards of the unit type, and a typical board of this type is also on view. Machined joints are a notable feature and therefore the gear is suitable for both indoor and outdoor use.

Also shown are pillar units for use in feeder pillars and kiosks, and a comprehensive range of various types of "Aeroflex" fuses for all power purposes.

C. H. Parsons, Ltd.

These manufacturers of "Britmac" accessories are drawing attention to all kinds of tumbler, industrial and ceiling switches; switch boxes and plates; end- and front-entry and industrial switch-plugs; lampholders, plugs and sockets, indicating units, bell pushes, etc.

Premier Electric Heaters, Ltd.

"Smoothwell" domestic flat-irons of from 3 to 6 lb., 300 to 450 W, are fitted with a "signal" connector in which a tiny pilot lamp glows while the iron is in circuit. The "Quickset" automatic kettle (illus.) of from 2 to 6 pints, 650 to 1,350 W, has an automatic bi-metal strip safety device with a pivoted catch which, when displaced by excessive temperature, releases a spring-loaded plunger, upon which a switch bridge is mounted, so breaking the circuit. When cool the kettle is reset by pushing the plunger back into place. Anti-furring pads are obtainable.

Reflector fires and radiators, including inset and imitation coal models, are made in a variety of styles and coloured surrounds, while coffee percolators, toasters, element heated saucepans and

The "Quickset" automatic kettle (Premier Electric Heaters, Ltd.)

egg boilers, boiling rings (1,500 W, with three-heat regulation) and hot plates, beverage urns and similar utensils are also displayed.

Radiovisor Parent, Ltd.

Automatic controllers for factory illumination, street lamps, signs, etc., consist of a light-sensitive bridge in a tubular weatherproof housing, mounted vertically so that daylight can enter at the top, together with a separate enclosure for the relay circuit and other components, which can be removed from the case merely by sliding them through the door. For counting articles on a conveyor or elevator they are made to traverse a beam of light from a projector lamp, which falls on to a receiver bridge whose relay circuit actuates an electro-magnetic counter.

The industrial smoke indicator utilises a somewhat similar arrangement, whereby the density of the smoke emitted obscures the light beam sufficiently to cause the alarm device to operate. A burglar alarm is constructed in the same fashion, but an infra-red ray is used in this case to render the beam of light invisible.

Revo Electric Co., Ltd.

This company's latest cookers, comprising the R.4 series, have such features as removable oven interiors in one piece, pressed hotcupboards without detachable cross bars, and a simple arrangement of hot plates, as described on February 7th, page 204. They are fitted with a new four-heat simmering-boiling plate (as illustrated on April 24th, page 606), as well as the patented "Superspeed." The R.8 model (illus. p. 861) makes its appearance for the first time. It is a somewhat larger edition of the R.4, being identical, except that the oven is 2¼ in. greater in height.

A full selection of fires is included, but street lighting fittings are confined to the series that has been specially developed for use with mercury and sodium discharge lamps. Particular attention is drawn to the design and construction of lantern No. C.9018, as outlined on page 641 of our May 1st issue.

A. Reyrolle & Co., Ltd.

The principal item on this company's stand is a 400-V totally automatic 300-kW electrode water heater arranged as a working demonstration. In the high-voltage type each electrode is surrounded by a porcelain tube of an internal diameter slightly larger than the external diameter of the electrode bushing. Water is forced in by a pump through the annular space thus formed, the constant flow over the electrodes preventing the collection on them of air or steam bubbles that would otherwise materially affect the resistance between phases and so cause unbalance; at the same time the water acts as a cooler of the conductors. Load regulation is obtained by three additional porcelain shielding tubes surrounding the electrodes. They are carried on a platform capable of being moved in a vertical plane by mechanism external to the shell. This moving platform also carries a replaceable counter electrode for minimising leakage-current pitting of the shell.

Medium-voltage heaters operate on the same principle, but the counter electrode is an open-ended box round each phase electrode. Load regulation is by means of flat slabs of porcelain interposed between the phase and counter electrodes, carried on a common platform so that their withdrawal exposes more electrode surface area.

A 20-kW 400-V electrode steam raiser is an example of the three-phase fixed load type made for dairies and farms. The shells are all of the same size, holding about 3.5 gals. of water. They accommodate electrodes of from 10 to 35 kW at up to 650 V, according to the rapidity of output desired. The steaming period can be prolonged by occasionally pumping water through the hand pump provided for filling the steam raiser. The maximum pressure is 25 lb. per sq. in., and the current falls to zero as the electrodes become uncovered.

The "Reymez" wash basin has an electrically heated storage tank in its pedestal, while household water heaters of from 1.5- to 20-gal. sizes are made with anti-drip and anti-siphonic devices, the surface loading of the elements being low to reduce scaling. Magnetic thermostats obviate the necessity for having the heaters absolutely perpendicular.

Other items comprise a sterilising cabinet for bottles or churns, immersion heaters of from 0.5 to 4 kW, and a 30-kW bank, the portable "Earthometer" earth and polarity tester, ceiling radiators, contactors, transformers, cooker control units, earth leakage trip switches, off-peak load control unit, plugs and sockets, house service fuse gear, and the "Vi-Tan" ultra-violet-ray lamp, which is jointly produced with the Thermal Syndicate, Ltd.

Rheostatic Co., Ltd.

A new industrial room thermostat has been developed, similar in mechanism to the Q-type that appeared last year, but encased in a different cover to make it suitable for factory situations. The Y-type immersion thermostat has been recently developed for use in small water heaters, its a.c. capacity being 8 A; the Z-type is much used in water heaters and circulators.

Minor modifications of the "CS" cooker thermostat have made this instrument still more sensitive and precise.

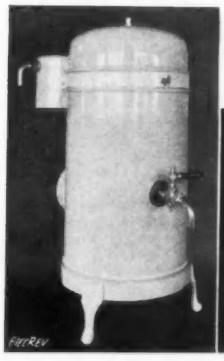
"Satchwell" type "Y" immersion thermostat (Rheostatic Co., Ltd.)

A complete range of electrically operated valves is offered for the automatic control of hot water systems of central heating.

Santon, Ltd.

A new d.p. water- and steam-tight 25-A rotary switch and plug in a metal case (illus.), with positions clearly marked, is cadmium plated as a protection against rust, and the cable inlets and outlets can be varied to suit requirements.

A new water boiler for tea-making



Santon tea urn and (below) water- and steam-tight switch-plug

(illus.) is shown for the first time in two models, one hand-fed and the other automatically controlled for both water flow and electrically. The latter is a stand model comprising a container of 3 gals. working capacity, with a supply tank, ball valve controlled. The water in a chamber adjacent to the outlet is maintained at boiling point by an element of 225 W, and the bulk of the water just off the boil. The action of opening the tap to draw water permits cold water to enter at a rate at which the boost elements of 4 kW will boil it. The cold water entering is used as a means of operating a thermostat which switches in the boost elements. Thus, 3 gals. of boiling water can be drawn off quickly, and thereafter continuous drawing is possible at a rate of one pint per minute.

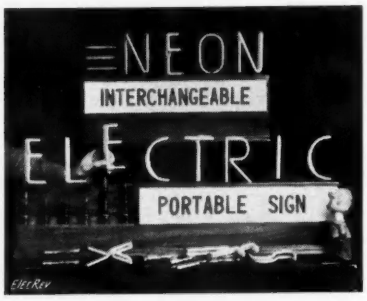
Other water heaters are of the thermal storage, circulator and "Circ-stat" types; also belt heaters, hairdressers' equipment, geysers, "Soon-Hot" quick service heaters, shower sprays in two forms, wash boilers, control units, rotary switches and plugs.

Siemens Electric Lamps & Supplies, Ltd.

Besides electric cookers, water storage heaters, tubular heaters, fires, irons, kettles, and toasters, there are house service meters including special cooker demonstration meters, with individual parts. Earth leakage trip switches with switch fuses and cooker control units incorporating earth leakage switches are shown. Soil-heating cables form part of the display, together with discharge lamps of various sizes and types, lanterns, reflectors and floodlighting units, and a range of tungsten filament lamps and coiled-coil lamps. A selection of study lamps completes the exhibit.

Silvagrey Electric, Ltd.

This company's "Neonames" and glowing letter signs can be hired and are interchangeable, so that the message can be altered as frequently as desired simply by changing the plug-in letters. Each neon-tube letter stands on a pair of screened (invisible contact) legs, that are withdrawable from fixed sockets. By day they appear as opal letters, and a subsidiary message may be displayed on the illuminated glass panel below the



Interchangeable plug-in neon sign letters (Silvagrey Electric, Ltd.)

sign proper in renewable transparent letters. Besides fixtures and pendants, a portable sign of this type is obtainable with a self-contained transformer and switch for plug attachment to a.c. lighting circuits.

Simplex Electric Co., Ltd.

This company's installation materials include the "Simplex" conduit system and all forms of switchgear. The latest developments in lighting equipment are lanterns for electric discharge lighting. In a full range of "Creda" domestic appliances special attention is drawn to cookers with new coloured enamel finishes and the "Credastat" automatic oven heat control (illus.).

Stokes Appliances, Ltd.

This company's table cooker is like a frying pan in shape, and contains a radiant element, for inversion over a plate on which the food to be cooked is placed. There is also an automatic egg boiler and a range of heating elements for various sorts of domestic appliances. The Hamilton Beach food mixer is driven by a small motor that is detachable from its table stand for use as a hand mixer; attachments are obtainable for shredding, coffee grinding, meat mincing, fruit juice extraction, and also potato peeling by revolving disc abrasion against the liner of the container.

Tricity Cookers, Ltd.

All this company's cookers are now supplied complete with a splash plate at no extra charge. A new model 777 (illus. p. 861) is being shown for the first time. It is made of pressed steel, being 35 in. in height, 20 in. in width and 17 in. depth. The oven is loaded at 1,600 W, its interior being 13 in. high, 14 in. wide and 11 in. depth. The hob is fitted with a 9⅞ by 7⅞ in. grill-boiler loaded to 1,800 W and a 7 in. diameter hotplate with a loading of 1,200 W.

Model 789 cooker in a pastel finish has been improved in appearance by the omission of the pot shelf and the use of smaller legs, while the oven depth has been increased by 1 in.; the quarter-turn of the oven shelves appeals to many users. Selected hotplates of both the high-speed and low-voltage varieties are on view also.

J. H. Tucker & Co., Ltd.

The "Ultraneat" 30-A cooker control units combine a pilot lamp and semaphore indicator, which is mechanically projected above the case by the main switch. The case has no unsightly projection, being mounted by means of internal countersunk fixing holes at standard brick centres, and the internal components are arranged to provide a central unobstructed passage for cables. For a.c. circuits the new 5- or 15-A short slow break switch controls the sub-circuit equipment. Numerous tests indicate that this type of switch reduces arcing to negligible proportions, eliminates pitting and burning of contacts, and ensures a much longer period of service for the switch. A special demonstration of this effect is being arranged.

A useful range of indicating pilot units for enclosed element appliances tells at a glance which circuits are "live" in connection with irons in laundries, tubular heaters in theatres, cinemas, churches, hothouses and horticultural buildings, hairdressing appliances and portable tools in industrial installations. They are available in 5- and 15-A surface and flush patterns, with or without a 3-pin socket point, and in multi-section assemblies up to six sections.

There are "Sincord" single and dual outlet switch sockets with convenient ceiling switch control for rapidly changing showroom lighting fittings and small power displays. The new range of "Sincord Major" ceiling switches have similar features to the 2¼ in. base patterns, but are assembled on larger bases, having 2 in. fixing centres for mounting direct on B.S. conduit boxes.

A special display is being made of the "Telacizing" rustproofing process for iron and steel, with particular attention to its use for domestic accesories. Other lines include "Titan" shockproof and ironclad switchfuses and ironclad splitters, and the new "Titan" coloured range of switches and switched socket outlets with isolated dolly reinforcement, four entry tunnel plugs (3-pin to B.S.S. 546) and extra wide overlap on flush plates, ¼ in. beyond box at each side.

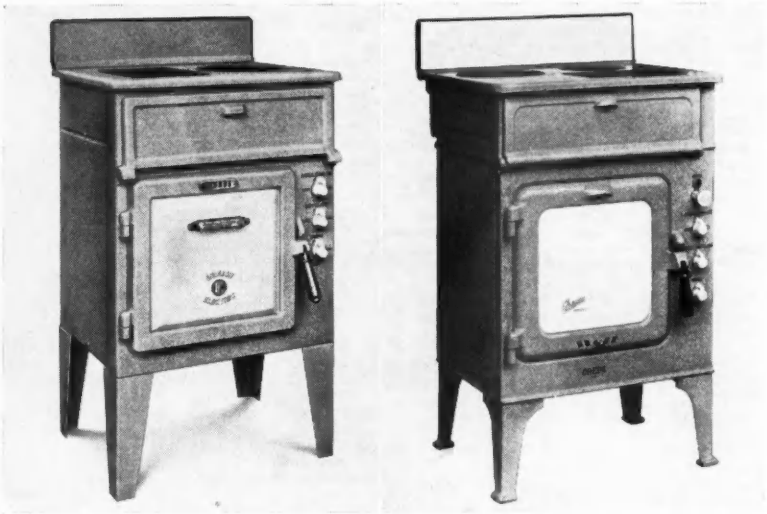
Unity Heating, Ltd.

Among tubular electric heaters of circular section loaded to 60 W per ft., with fixing brackets of various types, are busbar connectors for use with banks of heaters, oval section tubular heaters, vectors, from the smallest, loaded to 750 W, measuring 30 in. by 20 in. by 5 in., up to 2 kW, measuring 30 in. by 20 in. by 10 in., include types with self-contained thermostats. The "Sunglow" is a combined heating and lighting fitting in one unit.

Bi-metallic thermostats include a model with a hand switch incorporated and with special fixing plates to facilitate wiring and erection. Water heaters of rectangular shape and having nickel silver inner containers, electric towel airers, a 4-bar radiator, a linen cupboard heater, and a car engine heater complete this display.

Venner Time Switches, Ltd.

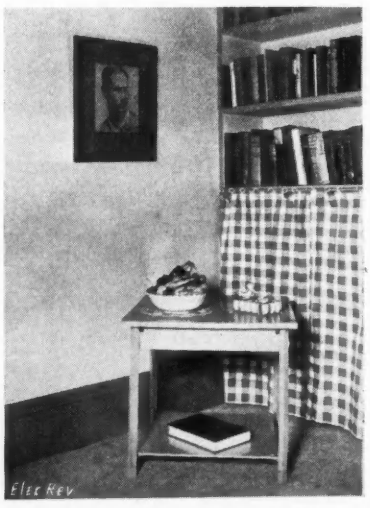
Various types of time switches are shown with clocks that can be hand or electrically wound, synchronous motor driven, or a combination of the last two. This type has a spring storage of thirty-six hours, and is time corrected every 62½ minutes. Thus, in the event of a failure of the supply the clock will continue to run and will be corrected when the supply is restored. Hand-wound clocks are arranged to be rewound



English Electric "H.C.212" cooker and (right) "Creda" cooker fitted with automatic oven heat control (Simplex Electric Co., Ltd.)

others with reflector plates, and also gas-tight and flame-proof heaters. Skirting panel heaters are of two types, one for installation on existing skirting, and the second for use, particularly in new buildings, in place of the ordinary skirting (illus.).

Flood heat radiators of varying sizes up to 25 in. by 13 in. are finished in a



A skirting panel heating installation (Unity Heating, Ltd.)

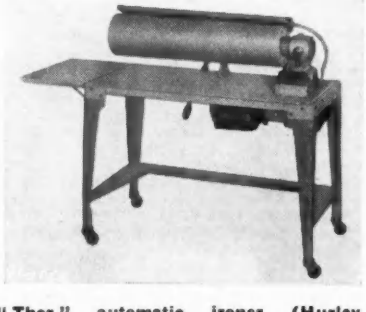
variety of vitreous enamel colours. Panel radiators are of the surface type, with a moulded edge which projects one and a half inches and the recessed type for flush fixing in walls or ceilings. Con-

every eight, fifteen or thirty-five days.

There are relays for water heating control in connection with street lighting and for lighting purposes in G.P.O. telephone kiosks; also an electrically operated stop-watch.

The frequency control clock has two dials, one of which indicates correct time (seconds pendulum movement), while the other is synchronous-motor driven from the supply to be controlled. The dual-coin prepayment meter is arranged to receive pennies and shillings. The "Wrad-Slot" meter is for use in hotels, etc., where the radiator may be used by inserting a coin when heat is required.

The "Cost-I-Meter" is for demonstration purposes, and the cost is indicated against time for the appliance being demonstrated. The two-rate meter changes from high to low rate and *vice versa* at any pre-selected times per day. The "rebater" is for use in the case of off-peak water control, and the hour meter records operation in hours up to 10,000 hours for use on controlled frequency.



"Thor" automatic ironer (Hurley Machine Co. (England), Ltd.)

Rural Electrical Development.

Farmers (and their wives) want electricity. Lord Eltisley, himself an agriculturist, sets out the methods of approach

By the Rt. Hon. Lord Eltisley, K.B.E.

THE development of electricity in rural areas has proceeded rapidly in the past few years, more so perhaps than would have been the case if the question had been regarded solely from an electrical point of view. National considerations have intervened. It is universally recognised that it is in the best interests of the nation to retain as many people as possible on the land. By the very nature of their calling country folk are deprived of many advantages obtained almost as a matter of course by those who reside in our great towns.

To hold our population on the land it is desirable, therefore, to bring such amenities of urban life to the countryside as are economically practicable. Country people must be prevented from drifting more and more into the cities. The problem has been intensified by broadcasting, which has brought vividly into the humblest homes the allurements, as well as the wider opportunities, offered by town life. It has brought home and emphasised the fact that the individual who has attained fame and wealth has rarely done so when engaged solely in rural pursuits.

[*Press Portrait Bureau*
Lord Eltisley is president of the British Electrical Development Association

Measured by the increase in the number of farms connected and the extension of distribution networks it is pleasing to find that the rate of electrical development in rural areas has not been unsatisfactory. Although practically nothing was done in this field until after the War and the pioneering work was necessarily on a comparatively small scale, there are to-day, it is estimated, about 25,000 farms taking a supply from the mains. A year ago the number was about 20,000. The same rapid progress is reflected in the official statistics of the numbers of electric motors and engines installed on farms; between 1925 and 1931 the number of motors rose from 700 to 2,475, an increase of 254 per cent., while the corresponding figures for oil or petrol engines increased by only 16 per cent., and those for steam showed an increase of 40 per cent. Later official statistics are not available, but it is certain that there has been a very substantial increase in the number of electric motors installed by farmers since these statistics were published.

The Farmer is Interested

Even more encouraging is the change which has taken place in the attitude of the farmer towards electricity as an aid to more efficient production. The farming community is by no means so closely wedded to traditional methods and so reluctant to consider suggested improvements as the townsman is apt to assume. Their particular type of production not only involves a multiplicity of interacting factors, but also long periods of time between cause and effect; they are bound, therefore, to continue to act upon the accumulated experience of their ancient industry until, after prolonged trial, any suggested departure has proved itself worth while.

It is not surprising, therefore, that their first reaction to so novel a form of light and power as electricity was one of scepticism. Their doubts regarding it were intensified by reason of electricity having sometimes been offered to them in the speculative form of electroculture, and as an agent for stimulating the germination and productivity of seeds rather than as a convenient and superior source of light and power. Nevertheless, we have witnessed within a short span of years a general conversion of the farming community to an active appreciation of the advantages of electricity. Our need to-day is not so much to convince farmers that electric light, power and heat are aids to prosperity as to persuade them that the terms upon which electrical service is available are equitable as between supplier and supplied, and at the same time likely to prove profitable to themselves.

This change in outlook is due in part to the intrinsic merits of electricity, aided by the active propaganda undertaken locally by a number of supply undertakings and nationally by the British Electrical Development Association. The demonstrations of electrical applications arranged year after year at agricultural shows in various parts of the country have had a marked cumulative effect and have made the farmer—and the farmer's wife—electrically minded to a degree which would have seemed impossible ten years ago. The example of the more enterprising farmers who have, often at the instigation of supply authorities, experimented with electrical equipment, has also been invaluable. On the other hand, a good deal must be credited to the intelligent receptiveness of the farming community. There are, for example, many days in winter time on which the farmer loses hours of work owing to lack of daylight. When electricity is installed in his barns and buildings he then obtains full benefit from the labour for which he contracts.

Experience indicates, too, that in most cases marked economy is effected by the use of electricity in place of alternative forms of power, and that the advantages it brings are further augmented by many ancillary economies, the value of which it is impossible wholly to assess. Convenience, adaptability, reliability, instant readiness, ease of control, absence of fumes and vibration, cleanliness, saving in space and labour, and immunity from ill-effects of frost—these and other characteristics of electrical appliances are not easy to assess in hard cash, yet farmers have been quick to grasp their practical value.

In no direction are the benefits of electricity on the farm more conspicuous than in the lighting field. Farmers are only too familiar with the drawbacks and deficiencies of the oil lamp and the candle, and their familiarity has made them very ready to adopt an alternative which gives a much higher standard of illumination, immediate control, and reduced fire risks. If rural electrical development could have been launched on a sound economic basis with lighting alone, it would have been a much simpler proposition than has been the case. At the same time it would not have been anything like so useful from the point of view of agricultural progress.

Diversity Essential

The economic necessities of the supply undertakings and the interests of agriculturalists converge upon the principle that electricity must be developed for as many purposes as possible on the farm and in the farmhouse. Under urban conditions, with a consumer available at every few yards, it was possible to carry on with a lighting load, followed at long intervals with minor "auxiliary" uses, leading up to cooking, heating, water heating, and other important loads. Under rural conditions, with consumers scattered over wide areas, the minimum demand necessary at the initial stages is much higher. The task of the supply undertaker is to persuade the farmer to "go electric" from the outset to a degree which was not reached in the case of the urban consumer until he had been on the mains for many years.

The chief endeavour of undertakers must be to provide electricity as reasonably and cheaply as possible. The practice of agriculture, while it is the occupation of the majority of the workers of the world and its varied products represent in value the greater part of human labour, does not bring great financial rewards to those engaged in it. Our countryman, whose resources are so limited, cannot afford to pay high prices for electricity. He seeks supply at a low rate, but at the same time he does not expect to obtain the same security against occasional breakdowns as the man in the town is accustomed to, at the price which he can afford to pay. Those who happen to have installed an electric clock realise how seldom interruptions of supply which they record cause any serious inconvenience or loss.

To provide a cheap supply in widely scattered rural areas the capital costs of distribution must be held down to the lowest possible figure. To do so it is necessary to make extensive use of overhead lines, not only for transmission from village to village but also for extensions from house to house in villages themselves. Unfortunately, even now it is only too often apparent that where the task of rural electrification has been carried out by urban engineers, accustomed to thinking in terms of supply to densely populated districts, they have failed to appreciate the considerable economies to be effected in this way.

To make an underground connection with its joint box, cable and high labour charges will cost anything from £3

to £10, or more. An overhead connection, serving precisely the same purpose, although sometimes, but not by any means always, somewhat unsightly, can be made from 15s. to £2. Transformer losses, too, are frequently higher in rural districts than in urban areas. To attain economy the size and capacity of the transformer must be carefully considered in the light of the duty which it will be called upon to perform. If, for example, the transmission pressure is 11,000 V, the losses of a single phase 10-kW transformer, which is the smallest one which can be used satisfactorily, working under average conditions, are in the neighbourhood of 1,500 kWh per annum. If a three-phase 15-kW transformer be installed they will probably amount to over 2,250 kWh per annum. There are cases in which the losses, which have to be carried by the supply authority, exceed the actual amount of energy taken and paid for by the user.

Making the Way Easy

The problem of rural distribution is, first, one of initial costs; that is to say, capital expenditure. Owing, however, to the limited resources of the community to be served, only a small proportion of users can themselves face the expense of installing electricity in their homes. It is, therefore, an essential condition for rapid and successful development that supply authorities should offer inducements to potential consumers to obtain supplies on easy terms.

The important question of salesmanship also arises. A sales resistance, not of the ordinary type, has to be overcome. Country people desire to have electricity but do not readily agree to initial payments, guarantees of consumption and standing charges, which supply authorities consider essential and equitable, but which they resent and look upon as unjustifiable. Resolutions passed by various branches of the National Farmers' Union, and letters in agricultural and other journals, testify at one and the same time to the farmer's appreciation of electrical service and his reluctance to accept the terms upon which it is generally offered. Something more is involved here than the traditional desire of the farmer to drive a keen bargain. It is evident that he considers the initial payments or guarantees demanded by a supply undertaking for a permanent and comprehensive electrical service to be onerous, even though he has been accustomed to invest his capital in power-producing plant, which is a wasting asset and affords him only a strictly limited service.

The situation can be met by employing competent electrical salesmen who know the agricultural mind and can talk to the farmer in his own language. Picturesque posters displaying lovely ladies in luxurious surroundings have little or no pulling power for him. Personal canvassing is the most efficient means of carrying on the work. Further, the influence of the salesman will be enhanced by a full and frank exposition of the situation from the point of view of the supply undertaking.

Few farmers seem to understand the problem of rural supply as it presents itself to the supplier. Knowledge of such items as the high percentage of distribution costs in the expense of giving service in rural areas, and the low margin of profit upon which the whole business is run, serve to correct the impression that the conditions of service are dictated by a grasping monopoly which is not concerned with affording a progressively cheapening supply to agriculture.

In overcoming the preliminary obstacles to electrical development on farms, the cultivation of the farmer's wife is as important as the education of the farmer himself. She is quick to realise that electric light, electric power, electric cooking, the electric iron and wireless from the mains, offer the readiest and most efficient means of lightening and enlivening her work, while from the supply undertaking's point of view the farmhouse demand is, both in magnitude and diversity, a very useful addition to the farm load.

The same broad principles apply in the development of the general domestic load in rural areas. Tariffs and services must be framed to encourage the fullest possible use of electricity in the cottages and small houses which constitute the majority of the dwellings supplied. Assisted wiring, hire or hire-purchase facilities and efficient service to consumers are essential items in securing and maintaining a remunerative demand.

Clearly, in a market of this kind, where the distribution costs are comparatively heavy and the maximum revenue to be expected from each consumer is on a modest scale, tariffs must be devised with great care to meet the economic needs of both supplier and supplied. It is also important to express them in the simplest and most direct fashion, and to avoid alternative systems of charging, which are apt to confuse the mind and engender suspicions. The idiosyncrasies of rural consumers have to be considered even more closely than in the case of urban consumers, since in many cases electricity is almost the only public service offered to householders, and in a village or hamlet the impressions made upon the first people approached and the experiences of the pioneer consumers become known to everybody.

Conditions for Success

Success will therefore depend largely upon the personal work of salesmen who are familiar with the outlook of country people and are able to establish confidence in the service. Given the right tariffs and appropriate methods of propaganda and approach, there is no reason why those living in the country should not quickly come to enjoy the electrical amenities hitherto regarded as the exclusive privilege of the townsman.

It is unnecessary to lay stress on the value of the power load obtainable from local industries, such as brickfields, quarries, garages, cement works, and so on, and also from the development and expansion of rural industries. Special attention may, however, be drawn to the wide field which is opened up by the increasing demand for improved water supplies in rural districts. Electric pumping lends itself admirably to water supply schemes from a single house equipment to a village or district system. These are fresh fields of electrical application which deserve to be carefully surveyed and energetically developed.

Edinburgh by night, showing the very effective floodlighting of the Castle

Battery Vehicles.

By E. E. Hoadley, M.I.E.E.

There is a good future for the electric van, provided certain requirements are met. The author states what these are and makes suggestions

FROM the evidence of one's eyes, whether in the streets, the technical Press, or the makers' catalogues, it seems that at last the electric vehicle is coming into its own. The electric vehicle is no new thing, for on several occasions in the past great publicity was given to the revolution it was prematurely expected to bring about in the transport world. There are many reasons why the electric vehicle has failed to become almost universal within the field for which it is suitable.

I have been in the electrical industry sufficiently long to remember battery-driven buses running on the streets of London, the introduction of the public service electric cab in large numbers, and the use of the private electric brougham in the West End of London. Of the last-named a few examples survived almost up to the present day.

It cannot be said that success has been missed for lack of trial; it would also be unfair to say that the disappointing result is because of trial. It is, however, worth while to see in what way the various failures came about, in order that in the revival of the electric vehicle, which is certainly promised at the present time, the same mistakes are not made again.

As the hon. secretary of the Electric Vehicle Committee for some years, I had an opportunity of knowing exactly what was going on in the industry, and from the information which was available to me, I came to the conclusion that the slow progress was due to a combination of many causes. Although the batteries then in use were not nearly so good or so suitable as are those available to-day, yet they were by no means responsible for all the failure. Many of the vehicles were badly designed, unnecessarily heavy and in many cases used for services for which they were fundamentally unsuitable.

For these and other reasons, the sale of battery-driven vehicles became an insignificant proportion of the total vehicle sales of the country. Even in fields for which the battery vehicle was, and is, eminently suitable, the petrol vehicle reigned supreme, the two forces helping this being lack of enterprise on the one hand and the great amount of energy expended on behalf of the older method coupled with its enormous importance on the other.

Good Prospects of Success

After many years of this moribund existence, it now seems that the electric vehicle is entering the market on a sound footing. Provided that advantage is taken of the knowledge already gained of what not to do, and that the use of the electric vehicle is advocated only for those services in which it can render lasting and successful service, I see no reason why its manufacture should not become a great industry, and the electrical energy used for charging batteries become a really worth-while contribution to the load of the supply industry. The electric vehicle has many advantages over the petrol vehicle, and there is very little that either can or does go wrong: if the battery is looked after with only average intelligence, it will give as good service as the rest of the equipment.

A 3½-ton electric lorry in the service of the Electricity Department of the Maidstone Corporation may be mentioned as an example of reliability. This vehicle—which is an example of what I have on previous occasions referred to as "garden roller engineering," was purchased at a fabulous price in December, 1918. It has been on the road on its regular job practically every working day since, and is still going as well as ever. The battery has been replaced at intervals of between three and four years. Beyond this and the replacement of tyres, it has only had one set of new driving chains and sprockets and one new spring. The motor has only been cleaned and the commutator skimmed up once, while advantage has been taken of Bank Holidays at various times to repaint the vehicle, and on one occasion to replace the open-type body with a new one. At this date, nearly eighteen years old, the vehicle, affectionately referred to by the men as "Granny," seems to go as well as ever, and it is certainly not too much to expect equal reliability from vehicles built to-day, with all the added knowledge which has been obtained during the intervening period.

Mr. E. E. Hoadley is borough electrical engineer of Maidstone

In order that progress may be made, I consider that a great factor will be the education of the public by some body, such as the Electrical Development Association, as to what an electric vehicle can and cannot do. When this has been done a great step forward will have been accomplished.

There are two main fields in which electric vehicles can be used with success, one being the slow-moving heavy traffic, such as brewers' drays and railway companies' delivery lorries, the other being the tradesmen's delivery vans in towns and cities where the actual mileage covered by day is not excessive and where the stops are frequent. A further considerable market can be found for the lighter vehicles for service work in connection with public utilities, such as electricity and water.

A fleet of heavy electric vehicles (2 to 3 tons) employed by the Sheffield Corporation Cleansing Department

The Light Van

In the past two years, several firms have put on the market light delivery vans of from 6- to 8-cwt. capacity, of which large numbers are now being sold. During the National Electrical Convention at Bournemouth last year, it surprised many people to see examples of these light delivery vans, and to hear of their guaranteed performances. As a result, a num-

ber of electricity supply undertakings have started using these vehicles for their ordinary service work, and in consequence of the experience gained, the makers are adopting a number of improvements which will widen their scope.

These improvements consist of increasing the level road speed, the speed at which hills can be climbed, and (very considerably) the mileage per charge. To-day it is possible to buy from every maker delivery vans carrying from 6 to 8 cwt. which will do a journey at twenty-eight miles per hour on the flat, and by means of a supplementary gear will climb all ordinary hills at reasonable speed, while batteries fitted to the vehicles are guaranteed to give from 40 to 50 miles per charge.

Personal experience has taught me that for many purposes in connection with an electricity supply undertaking, battery-driven vehicles can replace petrol vehicles with a great deal of success. While it is likely that possible speeds may not be quite so high, the distances which have to be covered are so short, that even if the point-to-point time were slightly exceeded (and this is not admitted, especially in streets carrying heavy traffic), the difference would be so small as to be negligible when compared with the overall financial advantage. In my own undertaking a start has been made in replacing petrol vehicles by battery vehicles. Although it may not be possible to do without the former entirely, many of those now in use will be replaced at the end of their useful life by battery vehicles.

Effects of a Good Example

As a result of the use of these vehicles by the Electricity Department, there are at the moment three employed by traders in the town, and their number will probably be rapidly increased owing to the favourable results being obtained. In one case, the delivery of milk, the trader reports a very great saving, as the vehicle goes out on a very early round, comes in and has a boost while the driver is having his breakfast, and the van is being reloaded. It goes out again during the morning, has another boost during the lunch hour, and makes a third round in the afternoon.

From the experience already gained, it may be taken as a fact that the light electric vehicle as made to-day can compete successfully with the petrol vehicle in a very large number of jobs now performed by the latter. If there is not a large expansion in their use the reason must be looked for outside the vehicle itself.

In order that the field may be cultivated properly, there are certain most important points to be observed. First, before an electric vehicle is sold, the requirements of the customer should be very carefully examined with a view to seeing whether they can be met successfully by this means. With this point settled, information should be obtained as to the weights generally carried, the mileage to be covered per day, and the nature of the road to be traversed. These particulars will settle the details of the chassis and the size of the battery.

It seems the right system for the vehicles to be charged in their owners' garages by night, at least until central charging garages exist in all towns. With the automatic charging facilities available at the present time, this presents no difficulties to the non-technical user.

Either the supplier of the vehicle or the battery maker should take a continuing interest in the vehicle and the way in which it is being looked after, for it must be remembered that in the early years of an industry such as this the good effect brought about by a satisfied user, or the bad effect brought about by a dissatisfied one, can help to make or mar progress. It may be that in a few years there will be throughout the land garages which will maintain electric vehicles in the same way as they maintain petrol vehicles to-day, but until that day dawns the electric vehicle industry will have to be fostered by the makers and the electricity supply undertakings.

The Most Important Factor

I would like to stress that perhaps the most important factor in the electric vehicle industry is for the makers or someone else to see that no vehicle is sold for work for which it is fundamentally unsuited. Both petrol and battery vehicles have their definite fields, but with greater use and added experience it is certain that the useful field of the latter will be widened from year to year. Much can be made among the traders in foodstuffs of the cleanliness, absence of smell, silence and other advantages of the electric vehicle, while to the ordinary public the results are equally good. The atmosphere is not contaminated by the smell of half-burned petrol or oil, and in doing away with horse-drawn vehicles the streets are not fouled.

I am so convinced of the future of the light electric delivery van as to deem it worthy of the organising talents of a Morris or an Austin to do for it what has been done for the petrol vehicle.

In the sphere of the heavy vehicle, progress does not seem quite so rapid, but it is significant that most of the firms who adopted battery-driven vehicles of two or three tons some years ago have not gone back to petrol. In London one sees electric vehicles in use by brewers, coal merchants, cartage contractors, and the like, successfully carrying heavy loads, but in the provinces they are much less common. I am confident that with the same modern outlook in the design of vehicles of this class, and the same push as is now being put into the light electric van business, a very profitable market will be found for the two- and three-tonners.

Should any examples be wanted of the lasting qualities of battery-driven vehicles, the fleets of Messrs. Harrods, Barkers and Selfridges in London will supply ample evidence, while for reliability many users having considerable fleets will prove that the time out of commission for each vehicle during the year is considerably less than that of a petrol-driven vehicle.

Even touring in battery-driven cars was done a good many years ago, and there is no reason why it should not become common. The requirements are, first, the standardisation of batteries in two or three sizes; this presupposes the standardisation of the voltage for the driving motors. With standard sizes of batteries will come standard methods of attaching the batteries to the chassis, and the adoption of a method by which the exhausted battery can be taken out of a chassis and a new one inserted in about the same time as it takes to fill up with petrol. If battery service stations were established throughout the country at intervals of between ten and twenty miles, and controlled by a central organisation

A typical 6-7 cwt. electric delivery van (Partridge, Wilson & Co.)

which was prepared to supply a charged battery in exchange for a discharged one, plus a small sum, a great deal would have been accomplished to make touring in many parts of the country by the electric vehicle more than a possibility.

What Electricity Undertakings Can Do

The provision of better roads will also considerably help to bring this about, while supply undertakings, both company and municipal, can do a great deal through their chief engineers and managers to increase the tendency by several methods:—

By using them in their own undertakings for all services for which they will give wholly satisfactory performance; by inducing other departments of the municipalities to use them for similar purposes; and (this is of the greatest importance) by putting as much energy into furthering the sales of electric vehicles as they put a few years ago into starting the business in electric cooking.

An additional, but relatively unimportant, point is to sell electrical energy for charging purposes at a low rate for an off-peak load, preferably under the conditions recommended by the Electrical Development Association, though from actual experience I find that it does not much matter whether electricity—except to very large users—is charged at one halfpenny or one penny. The cost of what may be classed as fuel is a relatively small proportion of the total, but it certainly is a good talking point to be able to show the prospective customer how very little he has to pay for electricity sufficient to run his vehicle for a minimum distance of thirty miles.

Far more important than the price of electrical energy is that the staff of the supply authority should, at least in the early years, take an interest in each electric vehicle that is purchased within the area and do their utmost to make sure that the owner is a satisfied customer.

The Vehicle Display at Edinburgh

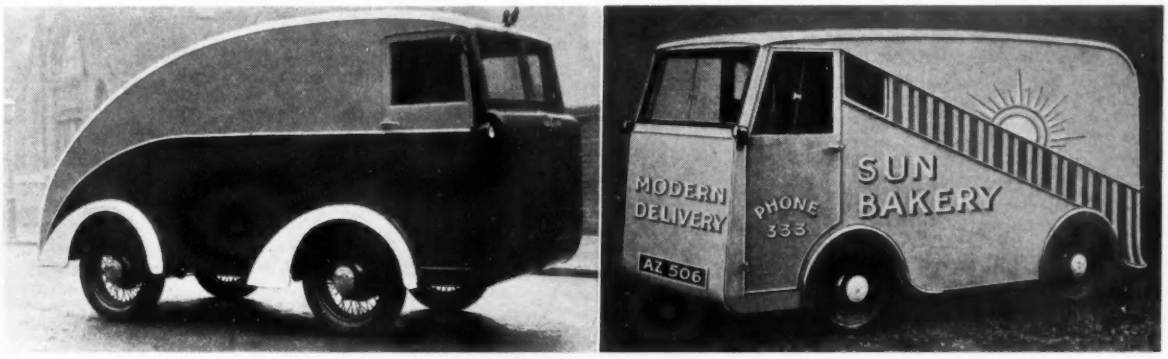
Vans, batteries and charging equipment

IN the preceding article Mr. E. E. Hoadley deals with the characteristics and advantages of the battery vehicle. There are now at least eight British concerns producing electric vehicles, several of them specialising in this form of transport. Visitors to the I.M.E.A. Exhibition have seen displayed there a few typical examples of the vans which are already available, together with a representative collection of vehicle batteries and battery-charging apparatus. These are briefly dealt with below.

Britannia Batteries, Ltd.—Lead-acid and nickel-iron alkaline cells are both constructed with tubular positive plates for increased mechanical strength. The lead cells are provided with negative plates with a "rippled" surface to induce freer acid circulation. The alkaline cells are of all-steel construction.

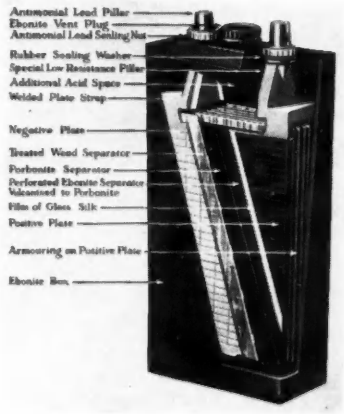
A. E. Morrison and Sons, Ltd.—Six vehicles, one of the "Airline" type as used by Electricity Depôts, another of being used for loading the body. There is also a 15-20-cwt. demonstration van and such component parts as a motor, differential worm gearing and controller assembly.

Victor Electrics, Ltd.—Two vehicles, a type B.10 small van (illus.) and a larger type B.20 chassis. The frames are all-steel, and either a wheel or handle may be fitted for steering as desired. The four-wheel brakes are connected to the



An 8-cwt. Electricar streamlined delivery van and the Victor "B.10" bakers' van

D.P. Battery Co., Ltd.—A "Kath-anode" cell as fitted to standard gauge locomotives, of similar size to that used on a locomotive employed by one of the Scottish power stations; also a smaller cell cut away in order to show the method of construction. "D.P." Planté



A cross-section of a Young accumulator

cells of the sealed pattern in moulded glass boxes are representative of the type usually supplied for emergency lighting installations; they are normally sent out in a fully-charged state with acid.

Electricars, Ltd.—One 8-cwt. streamlined delivery van (illus.) with a quadrant-shaped body and a roof sloping downward at the rear. Access is provided by a sliding panel in the roof, which is entirely concealed when open. The totally enclosed driver's cab has a safety-glass windscreen in a chromium frame. The drive is direct, and the simple drum controller employs a special circuit to minimise burning of contacts and fingers. The four-wheel brakes are independently operated by hand and foot. The standard 24-cell battery is of 168 Ah capacity for an average of 30 to 40 miles per charge at 16 m.p.h.

Metropolitan-Vickers Electrical Co., Ltd.—Three vehicles are shown, one being a 10-12-cwt. chassis with "Girling" brakes on all four wheels. The 10-12-cwt. van has an enclosed driver's compartment and low platform at the rear, revealed by a tail door, a sliding roof

the 15-cwt. size as supplied to Messrs. Martin's Bakery, of Edinburgh, and the third of the 25-cwt. size as supplied to the St. Cuthbert's Co-operative Society, of Edinburgh. This company's delayed-action controller is of the fully automatic master type, operating contactors which, in turn, vary the speed of the vehicle. It is so arranged that even violent depression of the foot pedal cannot affect the rate of change, which is limited to three seconds for each speed. By this means a simple foot accelerator is all that is needed, with a brake pedal. Britannia batteries are used. The three-wheel "horse" has a 7-h.p. motor and a delayed-action foot controller.

Murphy Cars and Trucks, Ltd.—A 10-cwt. van is equipped with a "Nelco" five-speed drum controller and 3½-h.p. motor; the 24-cell 234-Ah capacity battery gives a full-load mileage of 45 at 18 m.p.h.

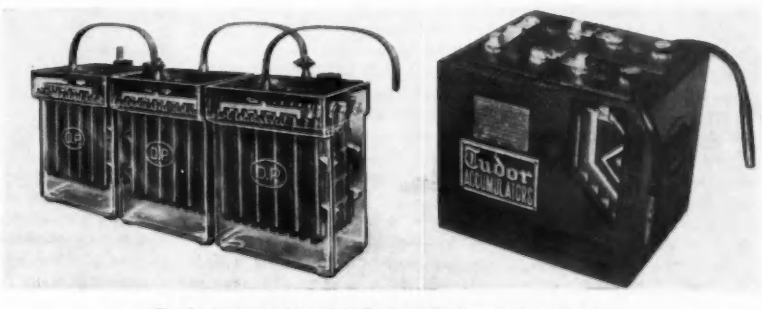
Partridge, Wilson and Co., Ltd.—Four (Wilson) machines, two chassis of the small L.W. 12-cwt., and the larger M.W. 31-cwt. sizes; also two complete vehicles, one of which is fitted with an open-sided milk delivery body and the other equipped as an electro-hydraulic lighting tower. Chloride batteries are fitted. The "XW Pup" for a pay load of 5 cwt. has a 2¼-h.p. motor.

Tudor Accumulator Co., Ltd.—Four vehicle cells of the KyD.13 type with a capacity of 193 Ah when discharged at the 5-hour rate, mounted on a wooden tray similar to those used on electric vehicles. This is cut away to indicate the construction and assembly of the cells, particular attention being drawn to the felted glass wool that entirely envelops the positive plates, which is said to prevent the accumulation of deposit at the bottom of the containers and so obviate the necessity for taking vehicles out of service for cleaning sedi-

switch, so that power cannot be applied until the brakes have been released. "Young" accumulators are fitted, and a quick-change system of double battery hire is available. The ranges per charge are forty miles at twenty m.p.h. in the cases of the 10- and 20-cwt. sizes, and thirty miles at fifteen m.p.h. for the 12- and 25-cwt. models, based on a 10-hour day with 100 stops when starting out with a full load and returning unladen.

Westinghouse Brake and Signal Co., Ltd.—One standard metal rectifier designed for charging a 30-cell lead-acid battery at a maximum rate of 20A. This is the size normally employed by vehicles of about 10-12-cwt. capacity, which, from the recent returns of the Ministry of Transport, appears to be the most popular size of vehicle now employed for local delivery work. These chargers contain no moving or fragile parts. When the battery is fully charged, the current is automatically cut off.

Young Accumulator Co., Ltd.—Component parts and sectional cells (illus.) illustrating the internal construction of traction batteries. One of the most important constructional features is the incorporation of a patented "armoured" positive electrode, the purpose of the armouring being to hold back the peroxide from floating in the electrolyte as soon as the normal shedding begins, thus preventing the particles of peroxide settling on the negative electrodes and minimising such local action as self-discharge, increase in temperature, shorting, loss of efficiency, the rotting of wood separators, etc. For sealing the armoured plates a special rubber compound is used which withstands the action of sulphuric acid and the effects of vibration.



Typical examples of D.P. and Tudor accumulators

Large Industrial Loads.

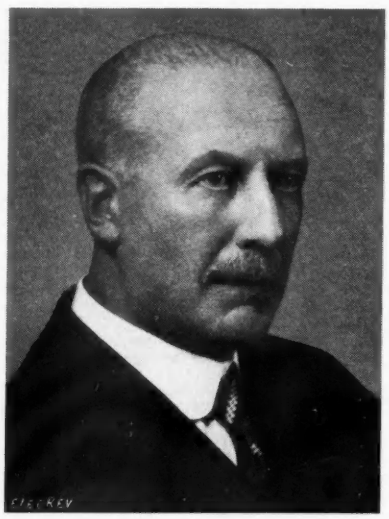
By C. D. Taite, M.I.E.E.

The author draws on his long experience to point the way to the conversion of works managers to electrical methods

ALTHOUGH this article is intended to deal more especially with securing the power user whose requirements lie between, say, 250 and 1,000 kW, it is felt that the suggestions contained in the article will be found to be applicable to the whole of the industrial power field.

As a starting point, one must rely upon the experience gained over a period of years in obtaining important new business and, if one knew precisely the reasons which had influenced existing large power consumers in deciding to take a public supply, one would clearly be in a better position to secure that business which one has so far been unsuccessful in obtaining. The problem must clearly be considered from the point of view of the power user, so that arguments may be brought to bear which will satisfy him that a service is being offered which it will pay him to use and which will enable him to improve his competitive position.

Now, when a new industrial consumer is secured, the service has been sold to him by someone or through some influence at some time, but few managers would be prepared to state the exact reasons which had finally influenced any one power consumer to adopt his authority's service. Similarly, but of even greater importance, how many undertakings could write down against every factory in their area the precise reasons why they had hitherto been unable to secure the business? Yet it seems true that any periodical survey of industrial progress, whether it be monthly, quarterly or yearly, must start at this point. Is it asking too much that each undertaking should keep an up-to-date and exhaustive record in respect of every potential industrial consumer of importance which it has failed to convert and then lay down a specific programme for keeping in touch with and influencing that potential consumer, if necessary over a course of years, until it is opportune for the sales engineer to endeavour to negotiate again?



[*Lafayette*

Mr. C. D. Taite, director and chief engineer of the Lancashire Electric Power Co., is chairman of the E.R.A. Council

As a case in point, take a textile mill whose engine has another ten years' life before it. What is to be our attitude towards that mill during the next few years? What new circumstances might arise that would enable us to convert the mill in a shorter period? A revival in the industry, or an extension of the particular factory, or a breakdown in the steam engine, or even the closing of half the mill might make it desirable and more economical for various reasons to abandon the old plant and adopt a public supply. The moral is that every unconverted factory needs to be scrupulously watched and contact with the owner maintained, even if there is no immediate reason for anticipating a change for some years.

There are many aids for keeping in contact with and continuously influencing individual factory owners over a period of years, and some of these are referred to below. But the most important factor in the past and the one which has invariably been the most successful in obtaining power business and will, therefore, continue to be relied upon in the future, is personal contact between the responsible engineer of the undertaking and the potential power user. While this contact is of paramount importance, there are methods of preparing the way for the activities of the engineer which must not be neglected and which, by unconsciously stimulating the interest of the owner, will much facilitate the engineer's task.

Sources of Information

For the purpose of obtaining indications of possible new business, every member of the staff should be encouraged to report information which may come to his knowledge regarding extensions of works or proposed developments. The *esprit-de-corps* should be such that every employé will desire to see the undertaking grow and feel a personal interest in every new activity, and this feeling will be fostered if due credit is given to any member of the staff who may bring helpful information.

This is of particular importance in a large scattered area, such as that covered by a power company.

But, as the securing of power business requires a full measure of tact and patience, as well as selling ability, on the part of the engineer handling this business, it is important that junior members of the staff should not be allowed to tell "half a story," or give information not strictly accurate. Unless this is realised, the engineer may find his task rendered more difficult at the very outset, as nothing shakes the confidence of a client more than statements which, on investigation, prove to be inaccurate.

Again, a close study of the trend of trade in any particular industry, involving the regular reading of trade journals showing contracts awarded to potential consumers, should provide clues as to the likelihood of factories being extended. In short, it is possible that a more thorough and systematic collection of commercial intelligence in the areas of most undertakings would be worth while.

Trade Journal Advertising

However cursory the attention that the potential consumer may give to his daily or local paper, there is one publication which he thoroughly follows—his particular weekly or monthly trade journal. The manufacturers of all forms of factory equipment realise this and make full use of the advertisement pages of such periodicals, but it can hardly be claimed that the electricity supply industry has followed this example in the past.

The Electrical Development Association has, when conditions have permitted, conducted brief campaigns in certain trade journals but, in relation to the potential power load in the country and having regard to the resources of our industry, no serious advertising through the trade Press has, as yet, been undertaken. Obviously, the task is a very large one and a costly one, but it is well worth consideration. Such campaigns render these journals more receptive of articles describing the conversion of mills, factories, collieries, &c., to electrical methods and, in this connection, it must be remembered that a works manager attaches greater importance to what he reads in his trade journal than to information received by him in many other ways.

In addition to trade Press advertising, it appears vital that the power supply industry should have a journal designed specifically for the works manager. This journal should be local in character and would describe from time to time the conversion of factories in the locality to electric drive; it would also deal with heating and heat-treatment processes and factory-lighting questions. At the present time E.D.A. is producing excellent isolated publications dealing with specific industries or processes, but what is needed in addition is a journal circulating within a limited area which would appear with regularity and would enable the local supply industry to be constantly reporting progress to the unconverted. That there is a call for such a publication is indicated by the fact that one or two of the larger undertakings do produce for circulation within their area a journal such as is here described, but the majority of undertakings in, say, a C.E.B. Area, are too circumscribed in their activities to justify such a publication solely for their own use; it should, therefore, be prepared under the direction of a local committee for use by all undertakings within the area.

Visits to Power Stations

Probably all important power stations receive visits from time to time from works managers' associations and scientific bodies established in their areas, but there is room for a much fuller use of this form of propaganda. Anyone who has observed the effect upon local councils, works managers and factory owners of a first visit to a big power station will realise how wonderfully impressive and valuable a sales force the industry possesses in its great stations. During the course of such a visit an opportunity will usually arise for calling attention to the huge coal stock provided to meet emergencies; a never-failing source of interest is the laboratory for coal and water testing and other research.

Attention may also be directed to the fact that year by year the cost of generation is reduced owing to the installation of new plant to provide for the growing load and to the scientific investigations constantly proceeding. On the other hand, a private installation will have its maximum efficiency when first

installed and will gradually become less efficient with age. While, therefore, a factory owner can look for steady reductions in charges over a period of years in respect of purchased energy, he must anticipate an increasing cost with his own plant.

Institution Papers

Engineers in the electrical industry are so busy discussing matters at the meetings of their own societies and conferences that they would appear to have insufficient time to present papers to works managers' associations and organisations representative of the various industries requiring a power supply. There is certainly room for a fuller use of this form of propaganda, and it will usually be found that a trade association will welcome offers of papers on subjects of interest to their members. There is, therefore, little difficulty in obtaining an audience.

Exhibitions and Demonstrations

While an ordinary exhibition and demonstration usually designed to interest domestic consumers may be of little or no value when dealing with the big industrial user, there are a number of important trade exhibitions held in this country which are visited by large power users and at most of which the electricity supply industry is at present not represented in any way.

It is not suggested that it is necessary to have exhibits or to make demonstrations at such an exhibition, but the question does arise as to whether an inquiry bureau might not be worth while, and whether the skill of the modern display specialist could not be used to advantage in putting over useful propaganda.

To sum up, there appears to be a need to study more closely than ever the peculiarities not only of each industry but of each particular factory, and a detailed record is needed on the supply authority's files of the processes, existing forms of power and financial position of every potential power user. It is then necessary to ensure that each one of them is brought under the influence of the methods mentioned above, in addition to the all-important personal contact with the sales engineer.

Above all, it is essential to cultivate the good will of the public and to maintain such an atmosphere of confidence in the service of the authority that potential industrial users will feel compelled at any rate to consult the undertaking before adopting any alternative form of power. In the strengthening of this confidence which the industry has been building up for many years past, the popularity of the domestic uses of electricity is increasingly valuable. Twenty years ago few works managers used electricity in their homes, but nowadays a manager may be unconsciously influenced in his business capacity by being given complete satisfaction electrically in his home; it may bring him to the point of seeing that, just as in the home the supreme convenience and cleanliness of electricity was never fully realised until it was experienced, so in the factory a similar state of affairs may apply.

Maintaining Friendly Relationships

While this article has dealt with methods of securing new business, it is of still greater importance to see to it that business, once secured, is permanently retained. These are days of fierce competition, and factory owners are constantly receiving tempting offers from private plant manufacturers whose responsibility towards the power user usually terminates with the satisfactory starting up of the plant; whereas the association of the supply authority with the power user is maintained so long as the supply of electricity continues to be taken. For this reason friendly relations with the consumer should be fostered and no effort should be spared to make the service in its widest sense as efficient as possible. If this principle is followed, the consumer will, in time, look upon the public supply as an indispensable part of his works organisation, and the good will so created will be found invaluable in the further development of the industrial load.

Reliability of Supply. By H. M. Sayers, M.I.E.E.

Have the substitution of bulk supply for local generation and the interconnection of systems increased the risk of interruptions?

RELIABILITY has always been aimed at by the designers and operators of public utility services, such as water, gas, transport and electricity. The higher the degree of reliability to which the public has become accustomed the louder are complaints when interruptions do occur. That is natural because long-continued reliability induces users to place increasing dependence upon the service and so increases inconvenience and loss when it fails.

Electricity supply in this country has earned a good character for reliability; there would not have been so wide an extension of its use had this not been the case. There are occasional serious breakdowns and recently the question has been raised whether they have become more frequent, extensive or prolonged by reason of changes in practice, especially the substitution of bulk supplies from base-load stations for local generation or the interconnection of systems, of which the most complete example is provided by the national grid. Opinions have been expressed that those changes, and especially the grid interconnections, have contributed to the frequency and to the severity of breakdowns. There are no statistics to which one might appeal, but, speaking from memory, breakdowns were not unknown when every area of supply had its own station and there were no interconnections.

Mr. H. M. Sayers

Under the modern regime of interconnected systems breakdowns can be divided into failures of generating units or entire generating stations; of interconnecting and supply lines; and of switchgear. A generating station which primarily serves its own local area has no additional risks of internal breakdown on account of interconnection. The general practice is that the plant running at any time shall have sufficient spare capacity to take up the load of the largest set in any station of a group, even during the system peak load. The transmission lines are designed to transmit that load to the weakened station. Hence the breakdown of a unit is not likely to do more than produce a localised and temporary disturbance, which may not be severe enough to interrupt the service to local consumers. The control aims at preventing risky overloading of any station and provides means for shortening the duration of any overloads which may possibly have been unforeseen.

The complete shut-down of a modern station by failure of the generating plant is unlikely and actually rare. Apparently, the greatest risk of such a calamity is that of lubricating oil fires—a risk now well appreciated and likely to vanish because the means of prevention are known and are being adopted. Whatever the cause of such a complete breakdown, the local area of supply is better off as regards the extent and duration of an interruption when interconnection is adopted than if the station were isolated.

Recent Experience

Station switchgear has been the origin of some of the most serious breakdowns. Recent examples are the disasters at Hell Gate, New York, and at Bradford. Just what started the switch-house fire at Hell Gate is not known. There is more specific evidence about the origin of the Bradford fire. In both cases burning oil aggravated the results of the initial electrical breakdown. In both cases there were interconnections, but there seems to be no reason to attribute the origin or the severity of the breakdowns to that condition. In both cases the initial faults occurred on apparatus at comparatively moderate voltages, 13.2 kV and 6 kV, respectively—the generated voltages. The interconnected stations at New York experienced increased loads owing to the way in which the l.v. distribution networks in that city are linked up, but the stations met those loads without serious difficulty. In the Bradford case, apparently the other stations were not disturbed at all.

So far as these two examples afford guidance, it seems that bus-bar sections controlling interconnections should be well separated from those directly serving the station generating plant and that local area feeders should be transferable to the interconnection section, if the generating sections are put out

of action. There is also the more general question of how to prevent oil-fires.

It may be suggested that the grid may increase the severity of short-circuits on the station switchgear. That does not seem very likely. Energy fed into generating station switchgear from outside would usually have to traverse transformers (possibly both step-down and step-up in series) and reactors calculated to limit the fed-back current to something much smaller than that from the close-by generators. The circuit-breakers pertaining to both the grid and the station should interrupt any fed-back current of large amount. There is a remote possibility of a fault on the grid producing sufficient disturbance to put alternators out of step with the system in one or more stations. The most serious danger of that kind is probably from switching together sections of the grid which have been separated for any reason and are out of phase. That can produce very violent disturbances of the whole system and may knock out running sets, possibly with material damage. Such an occurrence would indicate misfeasance on the part of a control engineer or switch operator and should not happen. It could be caused if there were automatic reclosing switches on the grid without synchronisation control, which is not British practice. Instability due to the overloading of a grid line is not likely to happen on the lengths of line between stations in this country.

When a station happens to be receiving a substantial part of its requirements from outside, the sudden failure of that supply may severely overload the running plant and cause complete or partial interruption of supply; that condition is an approximation to that of a system having no station of its own, which is discussed later.

For and Against

On the whole it seems that the additional risks of shut-down, partial or complete, by grid connection are quite small. On the other hand, the failure of a set or of a whole station need not interrupt the supply to local consumers because the interconnections come to the rescue. There is little or no publicity for such occurrences. The consumers usually know nothing of them.

Another credit item for interconnection is that it permits of a more orderly and thorough programme of overhaul and adjustment of generating plant than when stations were isolated. There must be many station men who remember the way in which repair and overhaul work was crowded into three or four summer months, and sometimes the anxiety whether what was necessary could be finished before the increasing loads of October called for readiness of all the plant for service. The fact that during 1935 only twenty-eight selected stations under C.E.B. control ran for the full 8,760 hours is some indication of the greater opportunities for maintenance work now afforded.

In the special cases of large cities served by a number of stations there is a growing tendency to build h.v. ring mains around the area, practically making a common bus-bar into which the stations feed, whence the lower-voltage networks are fed at sub-stations conveniently placed in respect to the load distribution. This plan has the advantage of separating the switchgear of the generating and sub-stations, so that any switchgear trouble is localised and every sub-station is fed from at least two directions. The ring main can be sectionalised at suitable switching points, in order that parts of it may be cut out when required.

A quite different plan is the "loose-linking" as practised at Detroit, for example, where each generating station has sufficient capacity for the usual requirements of its own area and the normal ties are made through circuit-breakers which trip on the passage of heavy overloads, leaving the area and its station to deal with its own troubles. Evidently this plan forfeits some of the advantages of interconnection, and it seems that at Detroit it is now being modified to something more like interconnection under central control. There was central control under the loose-linking plan, but the amount of interchange was limited as described.

Two Sources of Supply

The case of undertakings entirely dependent upon bulk supplies differs from that of those with active stations. In them reliability depends directly upon that of the supply lines and apparatus. High-voltage transmission and its concomitants have their own problems. Many of them have been foreseen and provided for effectively in the design of the British grid, but it was inevitable that experience should reveal some conditions beyond the range of experiment. A primary safeguard against interruption is that each undertaking should be fed from at least two directions; if possible, from two generating stations.

As regards mechanical stability of the overhead lines, so far there have been very few failures even in blizzard weather, which is fortunately not frequent in this country. The trouble that it is most difficult to prevent is that due to lightning, which although less frequent and much less severe in character than in some other countries, is not negligible in parts of Great Britain. Lightning surges may damage and destroy switchgear and transformers, and if a stroke occurs near a sub-station supplying a distributor it may interrupt the service quite seriously. Such things have happened, as people who read the technical papers know.

Safety of 132-kV Lines

The 132-kV grid lines seem to be little subject to lightning trouble, an experience in accord with that in other countries, since the higher the working voltage, other things being equal, the less is the trouble from lightning. Methods of protection are becoming more effective; the provision of earth wires over the lines, good earthing of the towers, earthed shielding of sub-stations, surge arrestors on transformers and co-ordination of spark-over values of insulators on the lines and on the sub-station apparatus are all useful. There is still something to be learned about the most effective combination of these devices, but good progress has been made. At present we do not know any way of protecting a sub-station and its apparatus from a direct hit by lightning, but direct hits on a particular spot are rare. It seems possible that sites where there is the least probability of direct hits may be selected from a knowledge of topographical and soil conditions.

A much more frequent source of breakdown is flash-over of insulators in consequence of the deposit of dirt, moisture and salt. Certain districts are particularly subject to this class of trouble, which sometimes puts lines out of service for a considerable time, and some serious interruptions have been so caused. This trouble afflicts districts where there are air pollution (generally of industrial origin), fogs and spray-laden winds from the sea. Deposits of dirt on insulators and foggy weather are the most common causes. Probably salt deposit is the most serious; some grid lines have been re-routed to avoid it. As to dirt and fog, periodical cleaning of insulators lessens the liability; probably improvements in insulator design coupled with cleaning at long intervals will eradicate it entirely. Great improvement has already been effected in certain districts (*e.g.*, the Thames estuary) where the conditions are particularly bad.

Switchgear and Transformer Failures Rare

There have been a few failures of switchgear accompanied by oil fires on the British grid, and some of transformers. So far as is known these have rarely caused interruptions of supply, except in the cases of lightning damage already referred to Generally there have been alternative routes and alternative sources of supply which could be brought into action.

Although this list of events which may interrupt supply to distributors may appear formidable, there is not really a high degree of probability of any of them being other than rare on that part of the grid upon which any particular undertaking depends for its supply—no higher than that of a failure of an isolated station. Even were there a slightly greater probability of a shut-down, the undertaking has the advantage that it need not worry about keeping the station plant capacity up to the growth of the peak load, with a safe amount of spare.

No doubt in the relatively small stations new switchgear may be necessary. For example, an undertaking with a top load of, say, 10,000 kVA will not have switchgear capable of dealing with the energy which may be delivered to a bus-bar fault by a 132 kV-grid ring main designed to pass 50,000 kVA in either direction as a normal load. In many cases such a small undertaking's switchgear may be adequately shielded by reactors; in any event there will always be the impedance of the grid transformers to reduce the magnitude of the fault energy.

On the whole, it does not seem to me that the risks of shut-down of an undertaking which relies on a bulk supply are materially increased as compared with those existing while it possessed an active station, a view that is supported by experience of bulk supply dating from long before the grid. This may not ease the smart of those who have suffered from the failure of a bulk supply while the memory is recent, but one has to consider the majority, not the exceptions; after all, many a small station has had to shut down more or less completely because its biggest set has gone down at a most unfortunate moment.

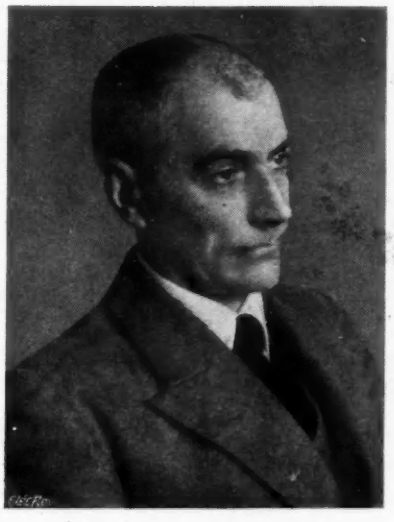
In my opinion supply does not affect the liability of failure of distributing networks, but it may give some protection against the worst consequences of breakdowns on extensive systems by the provision of two or more feeding connections.

Heat Treatment of Metals.

By W. Y. Anderson, M.I.E.E.

The efficiency, cleanliness and ease of control of electric furnaces is leading to their increasing use for annealing, carburising, tempering and similar processes

ONE of the persons selected to broadcast last Christmas on how they were spending the day was a working man at Sheffield who said he was about to go on duty in attendance at the largest electric furnace in Europe. This remark was not made for propaganda purposes, and it is indicative of the great advance that has been made in the use of electric furnaces in this country in recent years. There is unquestionably a very large potential electric heating load in this country which is estimated by one authority at something like ten times the load of all kinds now connected to the mains of public supply undertakings.



Mr. W. Y. Anderson is with the Birmingham Electric Supply Department

The concentration of metal industries in an area such as Birmingham has naturally led to a gratifying development of the industrial heating load which now exceeds an equivalent of 26,000 kW of consumers' plant. It is quite impossible to discuss adequately, in however discursive a manner, all the many applications of electricity for heating purposes in industry, and I therefore propose to deal with one phase only, *viz.*, the heat treatment of metals.

In every heat-treatment department, the most important unit is the furnace itself. When due allowance has been made for plant required for handling and quenching the material, &c., the fact remains that unless the furnace is accurate and efficient, the department will be a constant source of trouble, wastage and delay.

The two essential requirements if heat-treatment furnaces are efficiently to perform the work required of them, are the provision of sufficient uniform heat at all working temperatures, and easy and highly accurate temperature control. Furnaces should also have high thermal efficiency and be free from fumes and gases.

The control of temperature is complicated in non-electric furnaces by the combustion temperatures being considerably in excess of those required in the heating chamber, and the necessary reduction in heat not only involves high thermal losses but makes it difficult to maintain uniformity of temperature. Variations in the calorific value of the fuel and changes in climatic conditions also tend to produce inequalities in temperature, more particularly over long soaking periods.

With electricity, there is no difficulty in obtaining the exact quantity of heat required for any process, and this temperature can be maintained without variation for any length of time. The heating elements can be so distributed that absolutely uniform heating is provided, while the thermostatic control provided is more reliable and effective than with other methods of heating. Electric heating is perfectly clean and is free from the products of combustion which are present in fuel-fired furnaces; consequently no regulation of the air supply is necessary.

A further advantage possessed by electricity is the saving of floor space. There is no necessity to provide chimneys or flues, and as an electric furnace is a complete self-contained unit, it can be placed in the best position required in the factory from the production point of view.

Where Electricity Scores

The uses to which electric furnaces can be successfully applied in the heat treatment of metal include annealing, hardening, carburising, tempering, &c. Their chief advantages may be summarised as follows:—(1) The normally greater uniformity of temperature throughout the furnace, enabling a smaller furnace to be installed for a given charge. (2) Greater efficiency owing to the absence of flues, &c., and better insulation. (3) Entirely automatic regulation of time and temperature, which may also be used in conjunction with conveyors and the like. (4) Ease and accuracy of control of the furnace atmosphere. (5) Improved quality of work turned out, and saving in loss of faulty material and rejects. The last item is one often lost sight of, *i.e.*, the better quality of material after treatment by electrical heating, due to the inherent advantage of electric furnaces. This results in less wastage and reduces to a considerable extent the loss due to "rejects."

When estimating the cost of electric heat treatment the overall price should be taken into consideration, that is, allowance should be made to cover reduced labour charges, the value of floor space saved, the economies effected by its general high efficiency, and improvement in the class of work turned out which results in less "rejects." While it is difficult to set a monetary value on the convenience and adaptability of electric furnaces, the savings effected by most of the items mentioned are reflected in the total cost of the process.

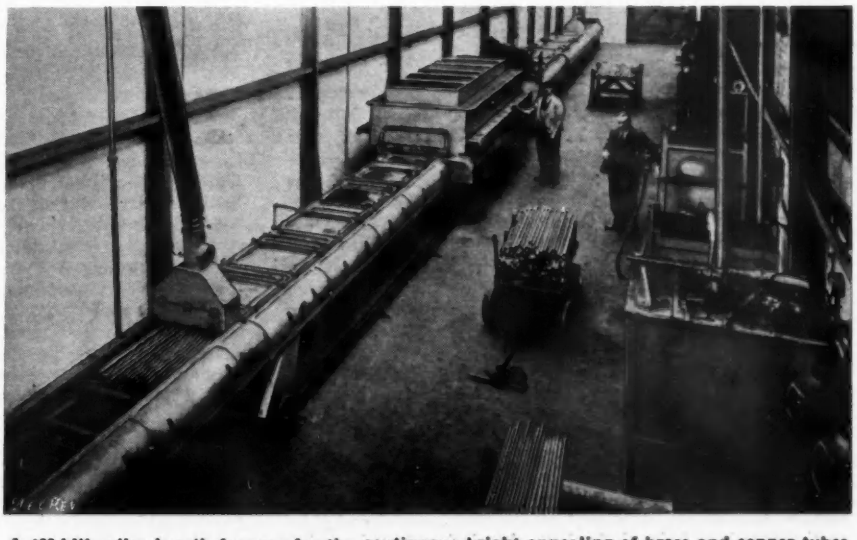
The electro-magnetic hardening furnace is a particular example of the adaptability of the electrical method. By means of two windings on the furnaces and suitable instruments on the control board, the exact moment for quenching carbon, carburised and low-alloy steels is automatically indicated, the critical point coinciding with the non-magnetic point of the steel. As the hardening temperature of these steels varies with the composition and also with the rate of heating, there is no other means of quenching at the exact moment on every occasion.

Two Typical Examples

It is difficult to obtain permission to publish actual costs as manufacturers are reluctant to furnish information which may be of use to their trade rivals. The following are, however, two typical examples of the success attained by the use of electric furnaces.

The first relates to the cost of carburising in a furnace of 3 ft. 4 in. by 2 ft. by 1 ft. 4 in., intended for continuous operation, but actually used only fourteen hours per day. The charge consists of two boxes approximately 16 in. by 16 in. by 9 in., having 1 cwt. 3 qr. of steel parts, and a gross weight of 4 cwt.

The average time which the boxes are in the furnace is



A 100-kW roller hearth furnace for the continuous bright annealing of brass and copper tubes

seven hours, while carburising is carried out at a temperature of 900 deg. C. During this period the consumption is 77 kWh. The cost of energy for carburising at 0.5d. per kWh is 0.086d. per lb. gross, and 0.196d. net. If the furnace operated continuously these costs would be considerably reduced.

The second example concerns the running costs of a three-phase, 25-cycle, 440-V furnace with a loading of 88 kW used for annealing brass, copper and nickel silver. Automatic temperature regulation is fitted to the apparatus, and a time switch is provided for the purpose of starting up the furnace at a predetermined time in the morning. The burden is treated in the form of coiled wire and strip. The consumption figures for annealing brass in this particular furnace are

A 110-kW furnace for the heat treatment of aluminium alloy tubes up to 20 ft. long

100 kWh per ton for continuous running, and 125 kWh per ton working day shifts only. The furnace has been in operation for some years, and maintenance costs, apart from the relining of the furnace, have been negligible.

It is not possible to furnish exact figures of the costs of electric heat treatment to cover all cases, as there are wide variations in working conditions, *i.e.*, in daily operating times, in operating temperatures, in weight of containers or conveyors, and in the output of material per hour. The following figures, however, can be taken as the results which may be expected under average working conditions for various processes:—

BRASS ANNEALING (*Batch Operation*).—In the annealing of coiled-brass strips the consumption of electrical energy is approximately 100 kWh per ton. If the process is made a continuous one, and a recuperative type furnace is employed in the annealing of small brass dressings, &c., over an eight-hour period, the consumption is about 60 kWh per ton.

HARDENING (*Batch Operation*).—Approximately 250 kWh per ton operating eight hours per day. Operating twenty-four hours per day the consumption falls to 190 kWh per ton.

CARBURISING (*Batch Operation*).—For a gross load of 1 ton and net load of 900 lb. of material to be treated over an eight hours' period of saturation, the consumption is approximately 300 kWh per gross ton and 750 kWh per net ton.

STEEL ANNEALING.—With batch operation the figures can be estimated at approximately 250 kWh per ton. For continuous operation the consumption is 200 kWh per ton. If the recuperative system is employed the figures are reduced to approximately 150 kWh per ton. These figures must be regarded as approximate only as the conditions of steel annealing vary so widely.

TEMPERING (*Batch Operation*).—In tempering the working conditions also vary very considerably, and it is difficult to furnish accurate figures; for instance, the tempering of high-speed tool steel calls for working temperatures entirely different from those required for the more commonly known tempering processes. The estimated average consumption of electrical energy for batch operation at a working temperature of about 300 deg. C. is about 80 to 90 kWh per ton, and at the higher temperature of 500 deg. C. figures in the region of 100 to 130 kWh per ton are obtained.

One of the accompanying illustrations shows furnace equipment at a factory in Birmingham designed for bright annealing brass and other non-ferrous tubes continuously. The tubes are carried through the furnace from the loading end (in the foreground) to the discharge end on mechanically driven rollers, and the entire furnace is filled with an artificial atmosphere to exclude air and prevent discoloration of the metals during annealing.

The furnace is rated at 100 kW and will deliver approximately 7 cwt. of annealed material per hour. The total length of the equipment is about 124 ft., and the elements in the heating chamber (in the centre of the illustration) are divided into three separate sections, each individually controlled by a temperature regulator, to ensure rapid and uniform heating. The artificial atmosphere is supplied by a separate plant shown at the right-hand side of the illustration. A patented indicator is used to show the position of each batch of tubes passing through the equipment.

The other illustration shows one of three similar furnaces installed at another Birmingham factory for the heat treatment of aluminium-alloy tubes up to approximately 20 ft. in length. This furnace is rated at 110 kW and is fitted with four powerful motor-driven air-circulation fans in the upper part of the cylindrical chamber for the purpose of transferring heat rapidly and uniformly from the elements to the charge. Since the working temperature is below 400 deg. C., air circulation of this kind is essential for strict uniformity and reasonably high output, and the furnaces have proved very effective in this respect.

The tubes are loaded in light perforated metal cradles, seen in the foreground, which are inserted and withdrawn by a mechanical charging machine, which can traverse across the mouth of the furnace. In the second similar equipment at the extreme left hand edge of the picture provision is made for quenching the tubes by a special machine immediately upon their withdrawal from the furnace. The latest furnace of this kind installed at the factory in question is of increased size and is capable of dealing with tubes up to 30 ft. in length.

Air Conditioning on Australian Railways

A SYSTEM of air purification was tried some years ago in an Australian express train, but the apparatus which has lately been installed in a lounge car on the Trans-Australian Railway is the first in the Commonwealth that cools the car in the summer, heats it in the winter and controls the humidity in conjunction with the air purification. Further, the sealed windows and insulation of the floor and carriage sides provide for quieter travel. In conjunction with the filtering apparatus, the slightly higher air pressure within the car maintains a dust-free atmosphere.

Details of the system, which is also being tried on certain of the Victorian and New South Wales trains, were given in a recent issue of the *Industrial Australian and Mining Standard.* Mechanical refrigeration is employed, using "Freon" as a refrigerant. The equipment comprises a compressor with drive, an air-cooled condenser, an air-conditioning unit (or evaporator), circulating fans, expansion valves, generator, motors, distributing ducts, switchboard with manual and automatic controls and signals for both electrical and refrigerating equipment, &c. In connection with the air-conditioning unit there is a small, automatically controlled heating coil for use in the winter. During the time that the air passes over the conditioning coils, either for cooling or heating, the excess moisture is removed and the relative humidity of the car is maintained at about 50 per cent., which has been found the most suitable for average comfort.

After an official visit of inspection Mr. G. A. Gahan, the Commonwealth Railways Commissioner, said he was satisfied that such installations would give an appreciable impetus to overland travel. The apparatus was expensive, but he thought that production methods would improve as the demand increased, and that the trend of prices therefore would be downward.

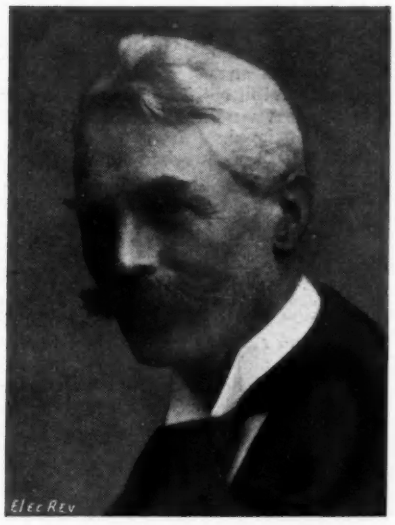
In the United States the Baltimore and Ohio Railroad and other administrations have devoted considerable attention to air-conditioning, something like 6,000 passenger cars being treated. The system is also being tried in Belgium on trains running between Brussels and Antwerp.

Making Electricity Safe.

Shock and fire risk can be minimised by educating the public and by sound and regularly inspected installations

By H. Marryat, M.I.E.E.

SUICIDES occasionally achieve their purpose by stepping off a railway platform, but it is very seldom an accident occurs in this way. The danger is obvious; everyone knows of it, and knowing takes the commonsense course of keeping a few feet away from the edge. The public is gifted with plenty of common sense; let people know all about the danger, and the precautions to be taken, and accidents are reduced to a minimum. One is not afraid of a railway station platform because death lurks just over the edge, and no one will avoid the use of electricity because he knows he may suffer sudden death if he stands in the bath and handles a live radiator frame.



Mr. H. Marryat, M.I.E.E., [Elliott & Fry M.I.Mech.E.

But people are afraid of a mysterious, undefined danger. They hear of people being killed in their homes by electric shock, and the more timid of them at least restrict their demand to essential lighting, and need persuasion before adopting the use of portable gadgets. They prefer the far more dangerous gas appliances because they know and understand the danger, and can guard against it.

Electrical people, both suppliers and contractors, having a living to make, have assured the public that electricity is safe, and adopted a "hush-hush" attitude to the accidents which occur. This policy worked very well when supply generally was at 100 V, and continued to be very serviceable with 200 V, until the general change over to a.c. greatly increased the risk of mishap. It is now no longer possible, and certainly not politic, to pretend that there is no danger in the use of electricity. Accidents happen, fires occur and people are killed by shock. No matter how we try to ignore these events, the stories spread, and the public, still uninstructed as to what and where the real danger is, and what precautions to take against this danger, becomes suspicious.

The obvious remedy for this state of things is to inform the public very fully and clearly of how to handle electricity with immunity from risk, just as it already has learnt to handle the far more dangerous media, gas and oil.

The Influence of the I.E.E. Regulations

That there are not more accidents than there are is due, no doubt, to the widespread adoption of the I.E.E. Wiring Regulations, which are framed to render new installations both fire- and shock-proof, and it must be remembered that where these regulations are not adopted in their entirety, their influence is such as to raise the level of even bad work very much above the worst that is possible. It is no doubt due to this influence that such figures as are available indicate a greater immunity from fire risk in this country than abroad. Unfortunately, there is not very much evidence available on this subject, but the accompanying table, comprising approximate data collected in 1930 by Mr. E. B. Hunter is indicative.

THE PROPORTION OF FIRES ATTRIBUTED TO ELECTRICAL CAUSES.

Territory.	Total fires.	Attributed to electrical causes other than lightning and static.	Percentage (approximate).
L.C.C. Area, 1934	5,526	547	9
Liverpool, 1929/34	3,675	360	9
Sweden, 1922/27	18,453	2,300	12
Norway, 1922/27	23,417	2,831	12
Denmark, 1922/27	3,772	444	11
Portugal, 1924/27	1,854	389	21
Shanghai, 1927/28	374	58	15
New Zealand, 1925/27 ...	—	179	—
Calcutta, 1928	661	86	13
Kansas State, 1928	3,128	225	7

It is true that by attention to the I.E.E. Regulations an installation may, without any undue expense, be handed over to even an ignorant user in a safe condition—safer by far than any gas or oil installation can ever be. But the installation will not remain in this condition: the user will probably add gadgets of his own buying, and may attach or use these wrongly. He or one of his family may make amateur alterations to the position of lights or switches, or may add either.

Even if nothing of this sort happens, the wires, conduits, fittings and accessories, especially flexible cords and portable apparatus, are subject to wear and tear and ageing, and must eventually reach a dangerous condition. There is nothing to surprise or alarm the user in all this. He is accustomed to things about a house wearing out, and glad to learn that, taken on the whole, electrical equipment lasts longer than many other household fittings.

Instructing the User

What has to be done to secure safety is to instruct the user in the use of his installation, to warn him of the danger of amateur alterations, and to warn him of the signs of deterioration and the need for periodical inspection and test. I would, therefore, make the following suggestions as a means of overcoming an increasing difficulty, and at the same time strengthening the confidence of the public in electricity as the safest means of obtaining light, heat and power:—

(1) Collect and publish data of all electrical accidents and explain their causes. If possible draw a favourable comparison with other and more dangerous media.

(2) Issue broadcast to electricity users circulars describing in simple language the safe way to use electricity, and the means of preventing accidents.

(3) That the Institution of Electrical Engineers be asked: (a) To add a section to the Wiring Regulations dealing with inspection and maintenance of an installation after it is completed and put into service. (b) Recommend the minimum interval of time which should intervene between inspections on installations of various classes. (c) Specify the minimum extent of an inspection in each of various classes of installation and prepare a prescribed form for the inspector to fill up and sign.

(4) That the Institution of Electrical Engineers be asked to add a regulation to the 11th Edition of the Wiring Regulations making it obligatory for a notice to be fixed on every installation, to indicate compliance with the I.E.E. requirements as regards safety upon a named date, and the importance of inspection at regular intervals by a qualified electrical engineer to ensure that the conditions of safety are maintained.

The Insurance Companies' Position

Someone will say: "Why should not the insurance companies carry the burden of inspection?" We know that upon serious risks they do, but it is not worth their while to inspect, apart perhaps from an initial survey, ordinary industrial and domestic premises. First, their interest is usually limited to the fire risk, apart from shock risk, and secondly, the very desirable competition between companies renders difficult the imposition by them of minor requirements. After all an insurance company may well argue that to remove all cause of risk would mean closing shop.

Nevertheless, since Mr. Musgrave Heaphy, of the Phœnix Office, drafted the first rules for safe wiring, no body of men has done more to support the adoption of a reasonably high standard of wiring practice than the fire office engineers, and only recently a leading office has circulated to all its policy holders an extremely valuable recommendation that installations should be subject to regular inspection.

It may be objected that the cost of inspections would become a serious tax upon the consumer: I do not think so. By following a prescribed routine specified by the I.E.E. and filling up a prescribed form, the time occupied upon sound installations would be very little. In cases where defects are found, the cost of inspection would in any case have to be borne by someone before repairs could be properly carried out. The frequency of the recommended inspections would obviously have to differ with the class of installation, and might perhaps vary from quarterly to bi-annual periods.

If the scheme suggested should be adopted, it would be necessary to define the qualifications of the electrical engineer competent to inspect and certify. In this connection it might possibly be advisable to differentiate between the more and the less important classes of installation, the former requiring the signature of a chartered electrical engineer, and the latter the alternative of a member of the E.C.A. or a registered contractor.

With regulations of this nature in force, not only might such spectacular happenings as the Wimpole Street fire be expected to cease, but countless minor accidents would be avoided.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

The All-electric Bungalow

In your issue of May 29th, 1936, you published a letter on this subject from Mr. J. Lee. Whilst appreciating his remarks with regard to the wonderful service offered by electricity for all domestic purposes, I fail to see how he manages to keep "well below an average of 10s. per week." The undermentioned figures, of kWh consumed per quarter, which are based on his letter, except where stated to the contrary, bear out my comment:—

Cooking, 270; washing, 52; refrigerator, 90; water heating (two baths per person per week), 312; water heating (for domestic use, not mentioned by Mr. Lee, 2 kWh per day), 180; wireless (4 hr. per day), 20; iron (2 hr. per week; this iron has a *very* low wattage), 8; lighting, 42; electric fires (one 2-kW fire, 15 hr. per day—no allowance has been made for other fires in the house), 2,700; total quarterly consumption, 3,674 kWh.

The total cost per quarter on this basis would be: Quarterly fixed charge for electricity, 12s. 6d.; hire of cooker, kettle and stewpans, say, 5s.; hire of refrigerator at 2s. 6d. per week, £1 12s. 6d.; hire of immersion heater, say, 2s. 6d.; 312 kWh at ½d., 13s.; 3,362 kWh at ¾d., £10 10s. 1d.; total cost per quarter, £13 15s. 7d.

The above figures may be slightly out of reckoning, due to my not having full details of the actual consumption, but they are right in essence. It may be argued that if one used an electric fire to heat a room the weather at this period does not warrant the use of a refrigerator; granting this slight drop in the presumed consumption of 90 kWh (a figure which, I believe, would hardly cover the full use of a domestic refrigerator in a really hot quarter), the average weekly bill would still be over £1 per week.

The chief advantage from a housekeeping point of view of an all-electric house is, I am sure, the electric fire, and it is this appliance which causes the sinking feeling one gets when looking at the meter dials! All-electric houses, therefore, will never be really common until either the price of electricity for heating purposes is reduced sufficiently to compete with coal (and the price would have to be extremely low), or some alternative method of electric heating will have to be evolved other than the present wasteful one of making a wire hot.

It may be pointed out that the increased efficiency and cleanliness of electric heating offsets to a large extent the increased cost over coal; no doubt it does, but it is as well to remember that when anything comparatively new is presented for approval which costs more than the old method of doing things womenfolk become hypercritical, and if the new scheme of things is forced on them, they rise up in arms, waving their brushes and pans in wild derision at our poor canvassers.

June 4th. TRULY RURAL.

Fuses on D.C. Circuits

The phenomena to which you draw attention in your issue of June 5th showing the failure of d.c. fuses on comparatively small overloads whilst successfully clearing much heavier faults, is, I think, capable of explanation.

The experience is one usually associated with fuses of the powder-filled cartridge type, in which the fusible element wire or strip is packed tightly within the powder. With a severe "short" the element is instantaneously volatilised and the arc blown out; with a lighter load the element is just melted, and, as correctly surmised in your remarks, intense heating may destroy the fuse before the circuit is cleared. It will be recognised that with, say, 500 V d.c. and a low impedance in the circuit a most disastrous effect can develop.

The problem has occupied my attention for many years and a solution has been obtained, as you will observe by referring to the list I enclose, showing recent tests made by the National Physical Laboratory on a 500-V, 100-A d.c. fuse. The successful pattern has practically two fuses in series, whilst powder has been eliminated. In one portion of the chamber a low-melting alloy junction gives a positive break on overload, and the other part consists of the short-circuit wires only.

Liverpool, *June 5th.* CHARLES W. COX, A.M.I.E.E.

Anonymous Advertisers

I heartily agree with "Responder's" remarks concerning the use of box numbers in the "Situations Vacant" columns. In the current issue of the REVIEW fewer than one-third of the advertisers give names, although the proportion giving districts is slightly better than "Responder" mentioned.

Surely advertisers could insert this small but often highly important piece of information and thus save the "seekers of work" the trouble and expense of applying for positions in unsuitable localities.

Another point is raised by the following incident: A young lady answered an advertisement giving a box number. She was successful in obtaining an interview, only to discover that the position was in another department of the firm by which she was employed.

Several times I have been told that it is no use answering advertisements giving a box number, so it would appear that "Responder" and I are not the only ones to feel dissatisfied.

June 6th. SEEKER.

Bequests for E.I.B.A.

Here is a recent happening in my office that I think should be broadcast to the whole electrical world. A man whom I had never met before came to see me and said: "All that I have and all the comforts and happiness in life that my wife and I have enjoyed I owe to the electrical industry in which I have been brought up and made my living. We have no children, and I think that anything I leave should go back to the industry from which I received it. I have come to satisfy myself that the E.I.B.A. is all I think it should be before I make my bequest."

He satisfied himself that ours is the only association covering the whole of the electrical industry, that our Council is representative of every class and grade, and that our affairs are carefully administered by well-known men and women. And he has made his bequest.

Example is better than precept; so I will make no comment.

A. HUGH SEABROOK,
London, *June 3rd.* Executive Officer, E.I.B.A.

In the Public Eye

The two ships most in the public eye during the last few weeks are each equipped with L.S.E. electrical plant. The *Girl Pat*—which, by the way, is not a trawler, but a motor fishing boat equipped for seine net fishing — has an L.S.E. generator to supply power to the "Scott" electric seine net winch. Possibly the skipper was influenced by the quality of the auxiliaries when deciding to "borrow" the vessel!

The "Girl Pat"

The other ship is somewhat larger and faster and has 18,000 h.p. of L.S.E. electrical equipment aboard.

LAURENCE, SCOTT & ELECTROMOTORS, LTD.
Norwich,
June 5th.

Heating and Ventilating Engineers

The programme for the summer meeting of the Institution of Heating and Ventilating Engineers, to be held at Cliftonville, Margate, from Monday, June 22nd, to Wednesday, June 24th, is now available. On Tuesday, June 23rd, there is to be a special meeting of members at headquarters, the Queen's Highcliffe Hotel, when a paper will be read by Mr. A. F. Dufton on "Heating Research." In the afternoon the golf competition for the "Haden" challenge cup is being held, while in the evening there is to be a banquet. For Wednesday a circular motor drive has been arranged. For further particulars, tickets, &c., application should be made to the secretary, Mr. C. C. Ferguson, 12, Russell Square, London, W.C.1, by June 15th (Monday next).

Electricity Supply to Gosport

A CABLE contract has just been completed by Messrs. Johnson & Phillips, Ltd., for the Portsmouth Electricity Department which includes some unusual features. The scheme was to furnish the Borough of Gosport with a bulk supply of electricity from the Portsmouth Corporation's generating station in Gunwharf Road, and consisted of runs totalling one-and-a-half miles of two land cables and a ¾-mile run of two submarine cables. The land cables are 0.25 sq. in., 3-core p.i.l.c. jute-served, steel-tape armoured with two hessian tapes overall and two bitumen papers over the lead, for operating at 11 kV. They are laid side by side and covered with 12-in. concrete markers. The submarine cables are similar but lapped with impregnated tape in addition to the bitumen papers, while they are double wire armoured with three hessian tapes overall.

From the transformer cubicle in Highbury Street the route passes along White Hart Road and through Broad Street to the Custom House Quay on "The Point," where two lengths of cable run under water to Fort Blockhouse. Here the track follows the outskirts of the Fort. Submarine type cable was buried in the shingle (for the most part under concrete and masonry), the more heavily protected type being used as a precaution against possible damage owing to sea water seeping up through the shingle, and also against subsidences in the adjacent ground. Further lengths of under-water cable had to be laid across the creek near the toll bridge, after which 700-yd. of land cable connects up to the new sub-station in South Cross Street.

Two lengths of 275 yd. each of submarine type cable were laid across Haslar Creek by means of two runs of 9-in. planking laid on the mud, strapped together at the joints with cable rollers bolted thereon at 9-ft. intervals. Wire hawsers were then run across and the cables hauled over the rollers by means of a winch, being subsequently lifted into a trench excavated between the plank tracks. This work was carried out during the neap tides, when all but 30 ft. of mud was laid bare at low water.

The Harbour cables could not, of course, be laid in this way, the distance between shores being approximately 900 ft. and the depth of water some 65 ft. Both drums, each weighing about 9¼ tons, were therefore loaded into a motor boat, special bearings being employed which were fully chocked against any possible movement. The drums were mounted fore and aft, slightly staggered, the cable from the foremost drum being led through a swivelling roller over the after drum, both cables leaving the boat over the stern. Thus a comparatively straight pull-off from each drum was effected. As the consequent drag over the stern rendered the boat uncontrollable, a larger motor-boat was employed to tow the loaded boat across the harbour. The cables having been secured on the shore at Fort Blockhouse, some difficulty was experienced in keeping the cable boat straight, owing to a north-east wind which blew the bow seaward while the towing boat was taking up her position. Once away, however, a straight crossing was effected.

As soon as deep water was reached the weight of cable over the stern would have tended to make the drums spin and the cable to coil on the sea bottom. This was checked by means of brakes working on the drum sheaves, the brakes consisting of four timbers per drum, mounted vertically, roped in pairs at the top and secured in the hold bottom. The four forward timbers had, of course, to be arranged to withstand the uplift due to the rotation of the drum, the other pairs being merely pressed on the hold bottom. On reaching the Portsmouth side the remaining cable was flaked on to the quay prior to jointing to the land cable.

In order to ensure a crossing free from interruption all craft were warned that cables were to be laid, as the wash from a large boat passing ahead or astern could cause a serious accident. The signals hoisted are of interest. The two balls indicate that the craft is uncontrollable and cannot give way to other craft, the cone being hoisted in addition during the actual crossing to show that submarine cables are being handled.

Hauling the cable ends ashore prior to laying

Transport Congress

THE annual congress of the Tramways, Light Railways and Transport Association at Brighton this week commenced with an informal reception on Wednesday evening at the Hotel Metropole by Mr. T. E. Thomas, chairman of the Council. On Thursday morning the delegates were accorded a civic reception in the Winter Garden, prior to the annual general meeting of the Association.

Trolley Buses

A paper on "Some Aspects of Trolley-bus Development" was next presented by Mr. A. T. Priddle (Associated Equipment Co., Ltd.), who described modifications in chassis design and disposition of electrical equipment. He said that regenerative and field-regulated control systems continued to have their advocates, the former undoubtedly holding first place in the majority of orders placed in the last two years.

Since the introduction of all-metal bodies the Ministry of Transport had insisted on low-voltage lighting and had withheld approval of high-voltage systems, except for composite bodies. The author finds it difficult to appreciate the justification for this attitude, since composite and all-metal bodies are (electrically) precisely the same.

Weight reduction and simplification should be the keynotes of future progress. The trolley-bus had many advantages, all well known. The tendency to burden it with countless "gadgets and frills" was to be deprecated and might easily become its undoing. The diversity of types demanded rendered it impossible to anticipate requirements and prevented the manufacturer building for stock.

After luncheon there was an excursion to Arundel and Worthing, where tea was served. In the evening the annual dinner, dance and cabaret took place at the Hotel Metropole.

Selling Transportation

This morning (Friday) Mr. A. A. Jackson (general manager, St. Helens Corporation Transport Department) was to submit a paper entitled "Merchandising Passenger Transportation," touching upon services to be sold and the staff, whom the author compares with salesmen; publicity, as a means of creating a desire to travel; and fares, which are compared with methods of charging in the United States, the author advocating some measure of consistency throughout a system.

As an alternative to an excursion to Eastbourne and Beachy Head, there is to be an afternoon visit to the works of Allen West & Co., Ltd., and the congress closes with a civic dance and cabaret this evening at the Royal Pavilion.

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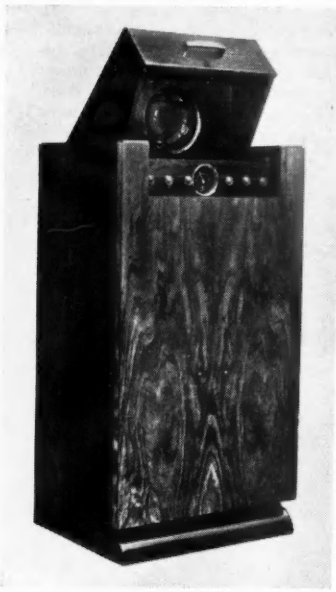
Modern French Radio Apparatus

Exhibits at the Paris Show

THE Paris Radio Show this year has been divided into two sections, the first of which was held from May 20th to June 2nd, and the second will be, as usual, in the autumn. The division is largely one between the French manufacturers and the wholesalers who deal mostly in foreign sets, the present section, in the main, being devoted to French makes.

There were several clearly defined trends to be noticed. In the first place, television apparatus was shown on a fairly large scale for the first time, some twenty manufacturers having sets on view.

Another tendency was towards variable selectivity, while several sets represented a real effort at improvement of the musical quality. Among the television sets the "Radio L.L." is designed for simplicity in operation and serves very well for the reception of the usual television broadcasts in France. The receiving set proper consists of a frequency - changing stage in which an octode is used, three stages of amplification of medium frequency, a double diode detector, a separator for synchronisation signals, two low frequency amplification stages for the light signals and a valve for the high tension. The movement of the beam is obtained by condensers charged through a high resistance, the discharge of the condensers being accomplished by thyratrons. The cathode-ray tube, of a diameter of 3¾ in., is set vertically, and the image is seen in a mirror placed above it at 45 deg., with a suitable lens arranged so as to increase the size of the picture. The mirror and glass are mounted in the lid, which can be opened or closed.



"Radio L.L." television set

A display by Sonneclair

A number of interesting improvements were to be noted in the "Acrea" sets. Musical quality is said to be improved by two separate loudspeakers, one 9⅝ in. and the other 8¼ in. in diameter. "Ondia" showed a nine-valve set with variable selectivity. Like most of the sets it covers three wave bands. A novel arrangement of the controls brings small indicators on to the dial itself, which is quite large, so that the position of each of the controls can be seen at a glance "Far" exhibited a set into which an anti-interference device is built. This consists essentially of a built-in aerial equivalent to a good loop of about 30 ft., with a compensation aerial which serves to catch signals opposed to those picked up by the main aerial by means of a special control device.

Although the prices of the better-class sets are fairly stable, there has been a noticeable fall in those of sets selling at below 1,000 fr. Several concerns have sets at popular prices and are making an effort to compete with the cheap American sets. Thus, "Jupiter" has a four-valve set at 575 fr. for short-wave reception from 20 to 50 metres as well as the usual medium- and long-wave bands.

With regard to valves, French manufacturers seem more and more to be following American practice. Some are doing this on the principle that as the American valve is made with a greater possible variation than the Continental type, they can turn out cheaply made and poorer quality goods. This, however, is not always the case, for several firms, such as Visseaux, make American-type valves of great precision.

One or two American houses showed metal valves. The B.T.H. Co. makes these at its factories in France, but many French makers still do not favour the metal valve.

In the Courts

SHERIFF VALENTINE has issued his decision in an action raised at Dumblane, Perthshire, by the children of a painter who met his death in an accident whilst in the employment of the Scottish Central Electric Power Co., Ltd., Stirling. An important point was raised as to whether deceased had acted outside the scope of his employment with respondents as a result of his having disobeyed explicit instructions given to him by the respondents' supervisor, and whether, in doing so, he had incurred an added peril which was quite unnecessary in so far as the due and proper performance of his work was concerned.

It was stated that the deceased man was employed by the respondents at Dunblane in connection with the painting of the surroundings for two transformers. The work which was done by him on the date of the accident was performed by him immediately beside the place where the respondents' supervisor was stationed. Respondents stated that deceased was required to paint certain portions of the electrical sub-station at Dunblane belonging to the Grampian Electric Power Co. No ladder was supplied by them to the deceased who, they stated, without their knowledge, caused a ladder to be brought from an outside source, and surmounted the ladder and commenced painting the frame work near to an air-break switch for isolating the sub-station from a 33-kV line. They averred that whilst doing this his body bridged the air gap of the switch, and he was killed. It was further maintained that deceased acted entirely contrary to explicit instructions given to him by the respondents' representative in charge of the work, and that they, in point of fact, had supplied the deceased and the other men engaged in the work with long handled brushes for the purpose of carrying out the painting work in a safe manner.

Sheriff Valentine finds that the deceased man came by his injuries in an accident which arose out of and in the course of his employment with the respondents. The work which was performed by the deceased although against instructions, was so performed by him for the purpose of, and in connection with, his employers' trade or business. In assessing compensation the Sheriff awarded the full sums claimed by the dependants of the deceased, and found the respondents liable in expenses on the higher scale.

An Uncovered Switch

For two offences under the Factory and Workshop Act fines totalling £30 were imposed at Nottingham last week on Pure Products, Ltd., soap manufacturers, of Colwick. Miss Johnson, prosecuting for the Ministry of Labour, said that in consequence of the company failing to keep the cover over an electrical switch a man was badly burned. The second offence was that the accident was not reported by the defendants to the authorities, and it was only following an accidental visit by an inspector to the factory four months later that it came to light. Mr. Sime, for defendants, said that the switchbox had received some attention, and that screws were not properly replaced. The fact that the accident was not reported was due to an oversight; the man had been paid compensation.

An Argentine Standards Association

With the title of the Instituto Argentino de Racionalizacion de Materiales, a new standards association for Argentina has lately been formed in Buenos Aires. One of the Committees of the new body will deal with standards for the electrical industry.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

The French Strikes

Our Paris Correspondent says:—"It is rather difficult to get any general view of the 'stay-in' strikes in France and their effect on the electrical industries. Rumours had spread that the electrical power plant workers in the Paris region intended to strike. This was, however, denied by Monsieur Belin, assistant secretary general of the French Labour Federation, who informed me that his organisation would do everything in its power to keep the plants in operation. He stated: 'We understand only too well that such a move on our part would alienate public sympathy from the strike movement. The electric power plants shall remain in operation.'

"In the plants of many of the larger manufacturers of electrical and wireless apparatus the strike is, however, complete. The Compagnie des Lampes, the Moteurs Ragonot, Edoux Samin electric lifts, G.M.R. Wireless and Radio L.L. are among those who have been hit. In one or two cases the direction has been able to come to an agreement with its employés, Radio L.L. having granted increases in pay of from 10 to 15 per cent. and one week's holiday with pay, with recognition of the union which now includes 90 per cent. of its employés. As quickly as one strike is settled, however, another takes place in a different plant. It is reasonable to suppose, however, that when the movement is ended there will have occurred an increase in salaries ranging from 10 to 20 per cent., and a considerable strengthening of the position of the unions in the electrical construction industries.

"In the installation branch the situation seems calmer. The secretary of the Association of Electrical Contractors informed me that although in a number of cases the workmen had presented demands to their employers, there was not yet any strike movement. The demands in this branch are for increased pay, a 40-hour week and paid-for holidays."

Wages in the Electrical Contracting Industry

In accordance with the agreement made between the Electrical Trades Union and the National Federated Electrical Association, the following are the new rates of pay in the electrical contracting industry:—Grade "A": 1s. 9d. per hour (this rate includes travelling allowance). Grade "B": 1s. 7d. per hour. Grade "C": 1s. 5¾d. per hour. Grade "D": 1s. 4¼d. per hour. These rates come into operation on the second pay day in June, 1936, for the period covered by that pay day, and remain current up to and including the first pay day in June, 1937. Until further notice the Grade "A" rate is subject to an addition of 5 per cent., making a total of 1s. 10d. per hour, while under Grade "B," in the Mersey area, within a radius of ten miles of the Liverpool landing stage, and also including the towns of Runcorn, Widnes and St. Helens, until further notice, an addition of 1d. per hour is payable in lieu of travelling time, making a total of 1s. 8d. per hour. The rate for Belfast (Grade "C") is subject to an addition of 3 per cent. to the standard rate until further notice.

Next Year's B.I.F.

Within three months of its close more than 60 per cent. of the space occupied at the 1936 British Industries Fair at Castle Bromwich had been definitely booked, and a further 25 per cent. is expected to be re-booked almost immediately. This announcement was made at a meeting of the Birmingham Chamber of Commerce on Monday by Mr. J. P. Plant, who was re-elected chairman of the management committee of the Engineering and Hardware Section of the Fair. The total space available at the moment is 292,531 sq. ft., of which 175,655 sq. ft. has been taken by 408 firms, and Mr. Plant stated that the interest taken by prospective exhibitors both old and new was greater than ever.

Price Reduction

The General Electric Co., Ltd., announces a reduction in the price of heavy-duty type soldering irons, loading 175 W and 300 W.

The E.D.A. July Programme

Refrigeration is the keynote of the July Sales and Publicity Programme of the British Electrical Development Association, and the window display for the month, which we illustrate,

ELECTRIC REFRIGERATION
SIMPLIFIES HOUSEKEEPING • SAFEGUARDS HEALTH
ELECTRIC REFRIGERATION
KEEPS FRESH FOOD FRESH
LESS FOOD WASTED MEANS MORE MONEY SAVED
SAVED MEANS HEALTH SAVED
ELECTRIC REFRIGERATION SAVES MUCH MORE THAN IT COSTS.

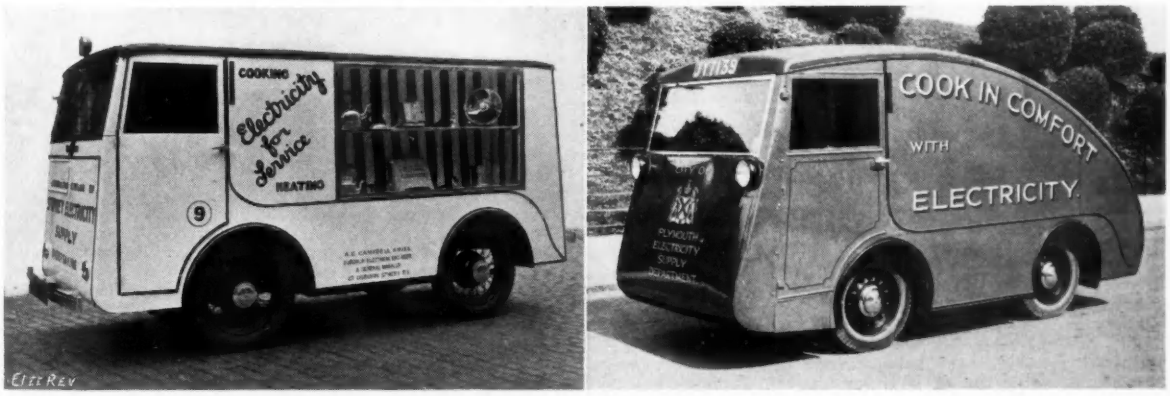
The simple yet telling E.D.A. window display for July

is simple in construction and easy to install. In connection with the refrigeration campaign the Association has prepared a number of advertisements for local use. All these include the "I'm Electric" figure, while space is provided for local copy. In addition to an eight-page folder which deals with the advantages of electric refrigeration generally, the Association has produced an attractive four-page leaflet in two colours which can be used for giving actual details of models, prices and hire-purchase terms. A new series of bowls scoring cards is now available, featuring the "I'm Electric" figure.

Coal for Public Utilities

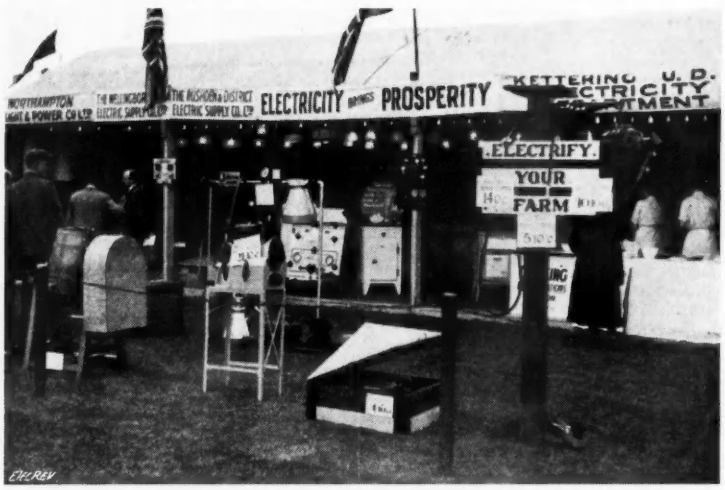
The Central Council of Colliery Owners, the statutory body set up under the Coal Mines Act, 1930, considered at its meeting on June 4th the representations which have been made by public-utility undertakings with reference to the supply and price of coal when the central sales schemes come into operation. It was reported that in the case of the iron and steel industries, which had already approached the Council in this matter, an agreement satisfactory to both sides had been concluded. The Council decided to appoint a special committee to meet the public-utility undertakings with a similar object in view and also to examine the constitution and procedure of the committees of investigation as determined by the Act of 1930. Under that Act there are national and district committees of investigation, all the members of which are appointed by the Board of Trade. One-half of the members are representative of employers and workers in the industry and one-half are representatives of the consumers, and there is in each case an independent chairman.

The Sunderland Electricity Committee has made the following recommendations, which it suggests should be sent to the



Two new municipal electric vehicles. Left: A consumers' sales and service van put into service by the Stepney electricity undertaking, and (right) a vehicle recently supplied to the Plymouth Electricity Department

Secretary for Mines and the local members of Parliament:—(a) The district selling organisation should be under a statutory obligation to supply coal of the quality required by the consumer; (b) the organisation should be under a statutory obligation similar to that which has been imposed upon gas, water and electricity undertakers, to the effect that no undue preference shall be shown to any consumer or class of consumer; (c) the associations representing public utility undertakers or other large users of coal should have access to the prices at which different classes of coal are sold to different classes of consumers, and (d) an appropriate and effective tribunal should be set up in each district, in place of the present committees of investigation, to deal with complaints as to undue preference and other matters relating to the working of the monopoly.



The combined display of the Kettering Electricity Department and Northampton Electric Light and Power Co., at the Northamptonshire Agricultural Show

American Electrical Exports

The exports of electrical machinery and allied material from the United States during the three months ended with March last attained a value of £3,960,000 as compared with £3,460,000 in the corresponding quarter of 1935.

Fire

The ground floor and basement of the premises of Ensign Lamps, Ltd., at 101, Southwark Street, London, S.E.1, were burnt out on Tuesday afternoon. The company tells us that, although one-third of the stock was destroyed or damaged, deliveries will not be affected in any way since a stock of about half a million lamps is carried, and further supplies are available immediately from its factory.

Lithuanian Tariff Increases

Modifications have been made in the Lithuanian Customs tariff for certain goods as from March 28th. According to the *Board of Trade Journal* these include electric generators, motors and transformers; coils, armatures, commutators and parts of electrical machines; starting and regulating rheostats (with sliding arm control) for electric motors and generators. The duty has been increased from 0.3 to 1.5 lits. per kg. for plant weighing 5 kg. or less, and from 0.3 to 0.75 lits. per kg. for plant weighing more than 5 kg. but not more than 20 kg. The duty on plant weighing over 20 kg. remains unchanged at 0.3 lits. per kg.

The Northants Agricultural Show

One of the attractions at the Northampton Agricultural Show, whch was held at Kettering on June 3rd and 4th, was the stand sponsored jointly by the Northampton Electric Light & Power Co., Ltd., and the Kettering U.D.C. Electricity Department. The efforts of the two electricity undertakings produced a very creditable display of the uses of electricity in agriculture. Among the exhibits were an electrically-heated greenhouse, incorporating a length of soil heating cable in actual use, sterilising chests and a variety of water pumps. Cooking demonstrations were also given. The accompanying illustration is reproduced from a photograph sent to us by Mr. W. A. Walker, the Council's electrical engineer and manager.

Orders Recently Booked

International Combustion, Ltd., has recently received an order for pulverising and burning equipment for the Bargoed power station of the Powell Duffryn Associated Collieries, Ltd. This will be utilised for firing two 60-ton high-pressure boilers. The order covers three 8-ft. by 48-in. Hardinge mill units, with burners, drum-type distributors, piping, fan floor steelwork and lighting-up equipment. The burners will be installed in each corner of each chamber and so arranged that by means of tangential firing high turbulence is obtained in the furnace. The total grate area of "L" stoker orders received last month was 3,219 sq. ft. This includes two for the Coventry Electricity Department, two for the Hull Corporation, and one for the Portsmouth Electricity Department (all twin stokers); one for Isle of Wight Electric Light and Power Co. and two for Amalgamated Anthracite Collieries.

Messrs. F. W. Brackett & Co., Ltd., have received an order from Glasgow Corporation Electricity Department for four of their patent "central flow" duplex band-type circulating water screens with automatic lubrication to be installed at the Dalmarnock power station. The company has also received the contract for the supply and erection of one drum-type sewage screen for the Blackpool Corporation.

Silk Screen Printing

This week the Association of Display Producers and Silk Screen Printers held its first exhibition of the printing at First Avenue Hotel, London, W.C.1. Printing by means of silk screens or stencils is a process the value of which is only just beginning to be realised. The screens are easily prepared either by cutting or by the photographic carbon method, and the printing, which has the appearance of hand-painted work,

New Showroom at Plymouth

How manufacturers of electrical apparatus might better serve the public was the keynote of a speech made by the Lord Mayor of Plymouth (Mr. H. M. Medland) in opening the Plymouth Corporation Electricity Department's new showroom and inquiry bureau in a central part of Plymouth, on Friday, June 5th. He said that the public had been given a wonderful selection of apparatus by the manufacturers, but he was of the opinion that the time had come when the manufacturers should think about lowering prices so that the working man and his wife could enjoy the benefits of electricity in their home. Manufacturers might also study the question of standardisation of apparatus, as at present there was an almost bewildering variety. Alderman W. J. Modley (chairman of the Electricity and Street Lighting Committee), who presided at the opening ceremony, said that last year's electricity consumption in the city showed an increase of 15 per cent., and during the past twenty-one years it had risen from five million to fifty million kWh. The interest taken in electricity for domestic purposes had increased to such an extent that the Department's showroom at Drake Circus opened five years ago had proved inadequate, and it was felt that it was imperative to move to a larger showroom, which had four times as much floor space as the former premises.

The new showrooms and inquiry bureau are at 83, Old Town Street, one of the principal shopping thoroughfares in the centre of the city. The ground floor of the building has been laid for the display of general domestic apparatus, with an inquiry bureau. The basement is divided into two sections, one of which embodies a demonstration theatre, particularly for cookery, while the other is for the exhibition of water-heaters and washing machines, and in addition contains a series of special lighting cabinets. Both floors have been redecorated.

The ground floor is well illuminated by cornice lighting carried round the walls consisting of 15-W lamps. Numerous lighting plugs are fitted on the walls and ceiling for the demonstration of all types of electric light fittings. In the floor and around the skirting boards power plugs enable different types of electric fires and other domestic appliances to be demonstrated to consumers. The shop window is equipped with a large number of lamps at the top which can be fitted with colour screens. The demonstration theatre has a platform at one end, on which is placed electric cookers for the purpose of demonstrations, a refrigerator, a table with shelves below for the exhibition of cooked foods, cakes, &c., while on one side is fixed a cabinet for storing the various kitchen materials, and on the other side a sink for washing up. At the back of the platform are mounted an electric clock, and a meter for indicating the number of units of electricity used during the cooking demonstrations. The platform is illuminated by means of special trough lighting. Dummy windows on each side of the room, with concealed lighting fittings, help to give an air of spaciousness to the room. The remainder of the basement is laid out on one side for the demonstration of water heaters, and on the other side are inset electric fires and ceiling heaters. A complete range of washing machines and wash-boilers is exhibited in this room.

There are also a number of special lighting demonstration cabinets. The modernisation of the shop front has been executed by Messrs. Harris & Sons to a design prepared by the city architect, and the wiring and decoration work of the interior have been carried out by the Electricity Department under the supervision of Mr. H. Midgley, the city electrical engineer. Assistance regarding lay-out of the showroom has been given by the Electrical Development Association, and in respect of the lighting arrangements by E.L.M.A.

may be done in any number of colours and on a wide choice of materials, such as wood, bakelite, glass, metal, celluloid, leather, fabrics, and oil cloth, as well as the conventional paper and strawboard. The low cost of the printing renders it admirably suitable for small runs of such things as show-cards, though many thousands of prints may be made from one screen.

Social Event

Messrs. J. W. Russell, Ltd., electrical engineers and contractors, of Watford, celebrated their twenty-fifth anniversary by organising a trip to Belgium last week-end for the staff and their wives and friends. Before leaving the opportunity was taken to present Mr. J. W. Russell with an electric clock and an illuminated address signed by the employés.

A Works Lighting Installation

With reference to the note which appeared under this heading in our last issue regarding the installation of Simplex reflectors at the works of Messrs. Wadkin & Co., Leicester, these reflectors are mounted at a height of 19 ft. and not 31 ft. 6 in., as stated in our note. The intensity of the illumination is 16/18 ft.-candles, which is an excellent average intensity for general illumination in a factory with bays 316 ft. in length.

Prices of Material

Messrs. Henry Gardner & Co., Ltd., report, June 10th: No change in the price of copper bars (best selected) sheet and rod, English pig lead and spelter. English block tin, £184 15s., £17 5s. decrease.

Messrs. Frederick Smith & Co. report, June 10th: Electrolytic copper bars, £40 12s. 6d., £1 2s. 6d. decrease. Ditto, ditto, wire rods, £46, £1 15s. decrease. Ditto, ditto, h.c. wire, 7½d., ¼d. decrease. Silicium bronze wire, $8\frac{1}{16}$d., ¼d. decrease.

Messrs. Edward Till & Co. report, June 10th: India rubber, Para fine, 9¼d., ¼d. increase.

The Fair Trading Policy

We learn from Mr. F. A. Rogers, the Secretary, that at a meeting of the Electrical Fair Trading Council held on 5th inst., the Council expressed its satisfaction with the reception that has been accorded to the Policy, and with the progress that has so far been made.

Trade Announcements

Messrs. C. Hounslow & Co., Ltd., have removed to Chalex Works, Southwick, Sussex.

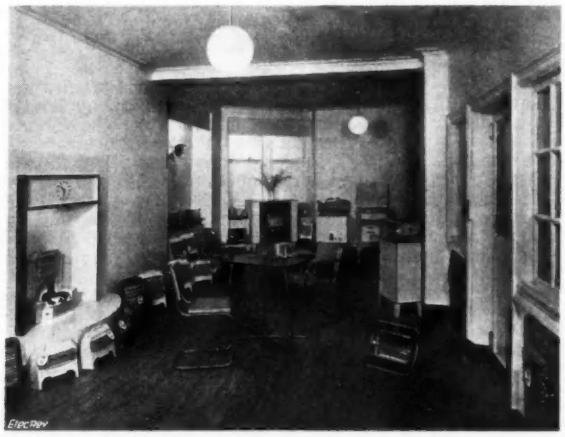
Messrs. Michael Black, Ltd., 138, West George Street, Glasgow, have been appointed sole Scottish distributors for "Coldspot" refrigerators and "Kenmore" washers, vacuum cleaners, &c.

Wright Electric Motors (Halifax), Ltd., Century Works, Pellon Lane, Halifax, have been appointed sole agents for the United Kingdom for the "Wülfel" fluid change speed gear.

Messrs. Brown Bros., Ltd., have completed their new building in Huntingdon Street, Nottingham, and they will be in occupation there as from June 15th. Telephone number Nottingham 3555. Telegraphic address "Vindec," Nottingham.

Acetylene Welding Congress

Among the numerous papers submitted at the Twelfth International Congress of Acetylene, Oxy-acetylene Welding and Allied Industries, which is being held at the Caxton Hall in London this week, was one in which Mr. R. Meslier compared modern oxy-aceytylene welding methods with electric



The showrooms of the English Electric Co., Ltd., which have recently been opened at the company's offices at Victoria Chambers, 42, Frederick Street, Edinburgh

arc welding, while in another Messrs. L. C. Percival and C. Coulson-Smith described radiography as applied to welding. Mr. H. C. Morgan's contribution dealt with the examination and preservation of wood poles and the prolongation of their life by a process of scouring and charring by means of an oxy-acetylene flame. Mr. S. A. Eskilson discussed shrinkages and associated stresses in fusion welding, both gas blowpipe and electric arc; while Messrs. C. G. Bainbridge and R. E. Dore gave details of how welding is being used for building up worn surfaces of crossings and for bonding rails for electric traction and for track circuiting on British railways. A paper by Mr. J. E. Languepin was concerned with flame welding and cutting in the construction of apparatus for electric resistance welding, and, finally, Mr. R. Salelles submitted a note on a method of simultaneous apprenticeship of oxy-acetylene and electric arc welders.

The Aldershot Tattoo

One of the great military spectacles of the year is the Aldershot Tattoo, and as this is held in the late evenings good lighting is of primary importance. Each year the Tattoo Committee and Captain A. J. Maine, the chief electrical engineer, contrive to introduce something novel in the way of illumination. This year, for the first time, they have installed some fine neon settings for the various tableaux. Neon lighting has been applied in one of the scenes in association with a representation of Carnarvon Castle with striking effect, about 850 ft. of blue tubing being used in this scene for outlining the castellations, loopholes, and porchway of the castle. Another arrangement consists of a sign in 3-ft. letters reading "Motto for Youth," while a further setting, 6 ft. high, embodies the Prince of Wales's Feathers. Beneath this there is a device in 3 ft. 6 in. lettering introducing the motto "I Serve." The portcullis lighting is another outstanding application of modern illumination practice in neon. The installation is so arranged that the general outlining of the castle in blue comes first. As the programme proceeds this lighting is extinguished and "Motto for Youth" is flashed on. This is followed by the Prince of Wales's Feathers and the motto "I Serve." This neon lighting was made and supplied by Claude General Neon Lights, Ltd., in collaboration with the General Electric Co., Ltd., which also supplied a number of floodlighting projectors, lamps, and other material for the special lighting features of the Tattoo. A large volume of motor traffic has to be handled, and in connection with the lighting of the various car parks and approaches G.E.C. "Wembley" lanterns are largely used.

The neon lighting supplied by Claude General Neon Lights, Ltd., at the Aldershot Tattoo

New Catalogues and Lists

Drake & Gorham Wholesale, Ltd., 77, Long Acre, London, W.C.2.—Catalogues of electric fans and refrigerators.

Wholesale Fittings Co., Ltd., 23/27, Commercial Street, London, E.1.—A pamphlet dealing with enclosed lighting units for commercial use.

Bakelite, Ltd., 63, Victoria Street, London, S.W.1.—"Bakelite Progress," illustrating and describing a collection of recent applications of bakelite materials.

International Marine Radio Co., Ltd., 63, Aldwych, London, W.C.2.—An illustrated art booklet entitled "Radio on Board the R.M.S. *Queen Mary*.

Bulwark Electrical Co., 12, Hart Street, London Road, Liverpool.—Full technical details together with illustrations and an N.P.L. test report on "Bulwark" high-rupturing capacity fuses and fusegear.

Newton & Wright, Ltd., 471/475, Hornsey Road, London, N.19.—Details of apparatus for stereoscopic, tele-radiographic and screen examination.

R. F. Winder, Ltd., Belgrave Electrical Works, Leeds.—A 64-page catalogue of surplus electrical materials.

Clifford & Snell, Ltd., Carshalton Road West, Sutton, Surrey.—A leaflet describing the "Loudaphones" fitted in the *Queen Mary*.

Siemens Brothers & Co., Ltd., Woolwich.—A new catalogue describing power fuse boxes.

Hanovia, Ltd., Bath Road, Cippenham, Slough.—Booklets dealing with new analytic lamps for fluorescence comparisons.

Hogan & Wardrop, Ltd., 25, Old Street, London, E.C.1.—A catalogue of wash-boilers made by Messrs. Simister & Co.

Imperial Chemical Industries, Ltd., Millbank, London, S.W.1.—A stiff-backed, 154-page art catalogue of electric lighting fittings sold by Lighting Trades, Ltd.

British Insulated Cables, Ltd., Prescot, Lancs.—A list of box condensers for power-factor correction.

Falk, Stadelmann & Co., Ltd., 83/93, Farringdon Road, London, E.C.1.—A catalogue of electric fans.

Hotpoint Electric Appliance Co., Ltd., 24, Newman Street,

Oxford Street, London, W.1.—An attractive leaflet designed to draw attention to special features of the "de-luxe" iron.

Goodliffe Electric Supplies, Ltd., 8, Eagle Street, High Holborn, London, W.C.1.—An illustrated list of overhead line fittings.

Bankruptcy Proceedings

C. B. Powls, the younger, trading as "Powls Bros," Main Road, lately Lambley Lane, both Burton Joyce, Nottinghamshire, electrical contractor and automobile engineer.—The public examination herein was held on June 4th at the County Court House, St. Peter's Gate, Nottingham. Debtor's ranking liabilities amounted to £636 and his assets to £40. In reply to the Official Receiver he stated that he began as an electrical contractor in November, 1933, and in March, 1935, he commenced as an automobile engineer. He had borrowed two sums totalling £184 since December, 1935. He attributed his failure to endeavouring to conduct the business on too large a scale, having regard to his lack of capital, underestimating on electrical work, decrease in turnover owing to bad weather during the winter of 1935-6, and heavy overhead expenses. The examination was closed.

A. P. Steer, 73A, Fore Street, Bovey Tracey, Devonshire, wireless dealer, formerly carrying on business at Station Road, Bovey Tracey.—The first meeting of creditors of the above was held at Exeter Bank Chambers, Broadgate, Exeter, on June 3rd. According to the statement of affairs prepared by debtor there were ranking liabilities of £528, with net assets of £115 and a deficiency of £413. The case being a summary one was left in the hands of the Official Receiver as trustee.

E. B. Page, 10 and 12, John Street, Hyde, Cheshire, electrical engineer.—At the public examination in this matter held recently at the Town Hall, Ashton-under-Lyne, it was disclosed that the deficiency was £796. Debtor attributed his present position to under-estimating on contracts and insufficient commencing capital. The examination was adjourned, the Registrar remarking that the examination had shown a very unsatisfactory state of affairs.

S. E. Oliver, 121, Adnitt Road, Northampton, electrical and radio engineer.—The public examination of this debtor was held at the County Hall, Northampton, recently. He said he commenced trading as an electrical and radio engineer at Abington Avenue in June, 1932, without capital. During the first year he sustained a loss, and in order to improve his position he removed to 121, Adnitt Road. The takings increased, but there were further losses. The statement of affairs showed liabilities of £360 and assets of £70, with a deficiency of £290. The examination was adjourned.

C. W. Tucker, carrying on business as Wilton Wireless Supplies, 11, Silver Street, Wilton, Salisbury.—The public examination herein was held at the Guildhall, Salisbury, recently. It was disclosed that the gross liabilities were £235, of which £218 was expected to rank for dividend. The net assets amounted to £55, and there was a deficiency of £163. Debtor attributed his failure to loss on a branch opened at Tisbury and insufficient trade.

Gilbert Lewis Electric Co., electrical appliance dealers, 66, Douglas Road, Acocks Green, Birmingham, and 4, Hurdis Road, Shirley.—Receiving order made May 28th on a creditor's petition. First meeting June 15th at 159, Great Charles Street, Birmingham. Public examination July 15th at the Court House, Birmingham.

G. H. Vardy (Vardy's Radio Service), 18, Catherine Street, Mansfield Woodhouse.—Receiving order made June 3rd on debtor's own petition.

T. S. Cocks, wireless dealer, 219, Milton Road, Portsmouth.—Receiving order made May 28th on debtor's own petition.

H. Carnell, radio engineer, 94, East Hill, St. Austell, Cornwall.—First meeting June 12th at 12, Princes Street, Truro. Public examination July 6th at the Town Hall, Truro.

S. G. Penrith, electrical contractor, 50, Mount Pleasant, Barrow-in-Furness.—Trustee, Mr. W. G. Pearson, 16, Cornwallis Street, Barrow-in-Furness, Official Receiver, released May 12th.

W. A. Hammond, wireless dealer, Middle Street South, Great Driffield.—Trustee, Mr. J. E. D. Stickney, 1, Parliament Street, Hull, Official Receiver, released May 14th.

A. E. Poole and **H. Marsters** (Poole's), electrical engineers, 33, Union Street, Wednesbury.—Second and final dividend of 5s. in the £, payable June 15th at Midland Chambers, Warwick Passage, Corporation Street, Birmingham.

G. H. Honeysett (Honeysett Radio), 71A, Manchester Road, Poplar, E.14.—Receiving order made May 29th on a creditor's petition. First meeting June 15th, and public examination July 23rd, at Bankruptcy Buildings, Carey Street, W.C.

Company Liquidation

Cabaret Electric Co., Ltd., 182, Vauxhall Bridge Road, S.W.1.—The statutory meeting of creditors of the above was held on June 4th at the offices of Messrs. Corfield & Cripwell, Balfour House, Finsbury Pavement, London, E.C., when it was stated that the shareholders had passed a resolution nominating Mr. W. A. J. Osborne as liquidator. A statement of affairs was submitted which showed liabilities of £3,124. The total assets were £1,230, with a deficiency of £1,894. The creditors decided to confirm the voluntary liquidation of the company with Mr. Osborne as liquidator.

Private Arrangement

Mrs. C. Hall, trading as "Leyton Battery Co.," Church Road, Leyton, London, E.10.—The creditors of the above were called together recently when a statement of affairs was submitted which showed ranking liabilities of £1,360, of which £1,158 was due to the trade and £202 to cash creditors. In addition, there were fully secured creditors for £300. The total assets were £415, with a deficiency of £945. Recently creditors had pressed and a writ had been issued. The debtor had no offer to submit. It was resolved that the matter should be dealt with under a deed of assignment to Mr. Markey, of 252, High Road, Leyton, with a committee of inspection.

Dissolution of Partnership

Wroe & Briggs, radio and electrical engineers, 26, The Strand, Bude.—Messrs. F. G. Wroe and H. B. Orr have dissolved partnership. Mr. Wroe will attend to debts.

Electricity Supply

Lighting, Domestic, Power

Ashton-in-Makerfield.—LOWER CHARGES.—The Urban District Council has reduced the charge for electricity for lighting from 4½d. to 4¼d. per kWh.

Australia.—NEW POWER STATION PLANT.—The Sydney County Council is considering the extension of its Bunnerong power station, states the *Electrical Engineer and Merchandiser*. At present the plant consists of six 25,000-kW Met.-Vick. turbo-alternators, and approval has already been given for the installation of a further 25,000-kW set to cater for the demand up to 1938. The general manager (Mr. H. R. Forbes Mackay) has, however, reported that at the present rate of increase of demand additional equipment will be needed by the winter of 1939. He recommends that two 50,000-kW sets shall be installed, one in 1939 and the other in 1940. The expenditure, including boiler plant, &c., is estimated at £1,922,000.

QUEENSLAND COMMISSION EVIDENCE.—Giving evidence before a Royal Commission, Mr. E. S. Cornwall, assistant manager of the City Electric Light Co., Ltd., stated that the company had evolved plans for providing supplies at rates only 10 per cent. in excess of those in Brisbane to areas as far as 100 miles south, and also to the west and north. This would be effected without subsidy or an increase in the price to city consumers. The company had a scheme for the complete electrification of south-eastern Queensland, but it could not carry this through unless it had reasonable assurance of security of tenure. He complained that the Brisbane City Council had erected a 70-mile transmission line to the Stanley River dam when a supply could have been given by a much shorter line from the mains of the Ipswich Electric Supply Co., Ltd. The Council's proposals contemplated only four towns and seemed to be an instance of the selection of particular areas that were deemed to be profitable without regard for planning, efficiency and future expansion. The town clerk of Brisbane (Mr. S. E. Travill) said that an opportunity for carrying out the Council's policy of extending the benefits of municipal generation would occur in August, when it would be able to exercise a statutory right to acquire that part of the City Electric Light Company's undertaking within the boundaries of the former South Brisbane City Council. He urged that the Commission should advise the Government to amend the Electric Light and Power Act, 1896, so that the Council could do this without extravagant cost. He further stated that the Council's aim was to be the sole generating authority, supplying outside areas preferably in bulk. A scheme for supplying electricity outside the Brisbane area had not yet been formulated, but the Council would be prepared to erect transmission lines to an economic limit which he placed at a radius of 100 miles.

NEWCASTLE POWER SALES.—In a large measure the increase of 29.56 per cent. in electricity sold by the municipal undertaking during 1935, as compared with the previous year, is due to an expanded demand for power. The Sulphide Corporation and Broken Hill Proprietary Co. absorbed an additional 5,461,000 kWh, while other large industries increased their consumptions by a total of nearly 8,000,000 kWh.

Bolsover.—NEW SUPPLIES.—The Urban District Council is taking steps to give a supply of electricity to the Stanfree area. The question of an extension to Oxcroft is being considered further.

Bolton.—MAINS EXTENSIONS.—Sanction to a loan of £50,000 for mains extensions is being sought by the Electricity Committee.

Burnley.—NEW PLANT.—About £10,000 is to be spent by the Electricity Committee on plant to ensure supplies of electricity to new brick works at Cliviger, the Dyneley Colliery and to sub-stations in the Burnley area.

Colchester.—INQUIRY.—A Ministry of Transport inquiry was held at the Town Hall, Colchester, on June 5th, by Mr. F. Gordon Tucker, concerning an application by the Central Electricity Board for consent to the erection of a Colchester to Coggeshall line across the properties occupied by Messrs. Robert Faulds, senior and junior, of Lower Hall Farm, Layer-de-la-Haye, and Mr. A. Cooper, of Wick Villas, Mersia Road, Colchester. Mr. D. R. Ward, representing Messrs. Faulds, said that, as there were already two lines nearby, it would considerably increase the difficulties of farming on modern lines. Mr. C. B. W. Orchard, for Mr. Cooper, a builder and contractor, suggested that the route should be moved farther to the west so that the line would be at the rear of the land which had been acquired for building. It was stated that the Air Ministry objected to the line going farther west. The Inspector afterwards inspected the properties.

Crewe.—SODIUM LIGHTING.—The Electricity Supply Committee is continuing its policy of improving street illumination by experimenting with sodium lighting in Badger Avenue, a main thoroughfare 1½ miles long.

Deal.—POWER STATION IN COALFIELD SUGGESTED.—The Town Council is to urge the Electricity Commissioners to consider the erection of a power station in the Kent coalfield. At a recent meeting it was stated that coal was taken from Betteshanger (in the Deal district) to Barking and Brighton to generate electricity for the town's use when, in the opinion of the Council, power should be generated actually in the coalfield.

Eastbourne.—PURCHASE OF APPARATUS.—Sanction has been obtained by the Electricity Committee to a loan of £15,000 for consumers' electrical apparatus.

Epping.—ELECTRIC STREET LIGHTING PREFERRED.—The Urban District Council has decided to adopt electricity for street lighting in place of gas, and has entered into a ten-year contract with the County of London Electric Supply Co., at a cost of £554 per annum.

Finchley.—METERS.—Permission to borrow £15,000 for meters is being sought by the Electricity Committee.

EXTENSIONS.—At a cost of £2,447 mains and plant are to be extended to improve the supply in the Holne Chase area.

Glamorgan.—ELECTRICITY IN AGRICULTURE.—In response to a suggestion from the Electricity Commissioners, the County Agricultural Committee has appointed a sub-committee to secure all available information on the question of the electrification of rural areas in South Wales.

Glasgow.—TARIFF REDUCTION.—It is proposed to reduce the secondary rate under the domestic service tariff from 0.3d. to 0.25d. per kWh.

Hull.—NEW EQUIPMENT.—The sidings and fuel handling plant at Sculcoates power station are to be extended at a cost of £14,000.

Inverness.—HYDRO-ELECTRIC STATIONS.—A proposal for closing down the Bught and Inshes hydro-electric power stations has been rejected by the Town Council. Excessive cost was stated to be the reason for the proposed suspension of operations.

Johnshaven (Kincardineshire).—ELECTRIC STREET LIGHTING.—A scheme for electric street lighting has been approved at a meeting of ratepayers.

Korea.—HYDRO-ELECTRIC POWER STATION.—The first hydro-electric power station of the Choshinko Hydro-Electric Co. in North Korea has recently been completed and put into operation; it is stated to have a capacity of 108,000 kW.

Lancaster.—NEW FEEDER.—The electrical engineer has been authorised to carry out the work of providing a feeder to Morecambe, and application is to be made for sanction to borrow £3,100 for the purpose.

Leigh.—RESULTS AND PROSPECTS.—In the past year the Electricity Department has experienced a considerable influx of business, but the borough electrical engineer (Mr. J. B. Hudson) is confident that the records established will soon be eclipsed. For instance, several inquiries are in hand for increased demands for industrial power purposes. The successful operation of the showrooms and installation section continues, and to them is credited much of the development which has taken place. Of the 896 new consumers connected (a record number), 566 had their electrical installations carried out by the Department. The total sales amounted to 14,916,490 kWh, being an increase of 10.7 per cent. on the previous year. The most notable expansion in demand was for combined lighting and heating (20.1 per cent.), but notwithstanding that the majority of consumers who can do so have adopted the all-in rateable value tariff the purely lighting sales rose by 12 per cent. More extensive use was made of electricity for public lighting, there being an increase in consumption under this heading of 19.1 per cent. The maximum load recorded was 6,234 kW (5,832 kW), with a load-factor of 27.24 (28.46). An average of 1.07d. (1.08d.) was received per kWh sold, and there was a net balance on the year's working of £9,759.

Leyburn (Yorkshire).—STREET LIGHTING.—The North-Eastern Electric Supply Co., Ltd., is to provide electricity for street lighting at Leyburn for the Parish Council. Fifty-one lamps will be installed.

Lincoln.—LARGE DOMESTIC EXPANSION.—Although the temporary showroom premises at Broadgate are inadequate for the growing needs of the Electricity Department, good use has been made of them. The original mess rooms were adapted as a demonstration room, and the attendance at the twice-weekly meetings has steadily improved. The results of this work can be appraised from the figures given in the report of the city electrical engineer and manager (Mr. F. Newey) for the year ended march 31st last. During that period appliances with a loading of 733 kW were connected following showroom sales. There was a growing demand for electric cookers and also water-heaters, 502 of the latter being installed. The total increase in load due to hired domestic appliances was 2,650 kW, and 30.5 per cent. more electricity was sold for use in the home. A smaller proportional increase (5.1 per cent.) is recorded in the case of power. This, however, would have been greater had not an important consumer used plant installed for test and demonstration purposes to generate part of the energy required for production. Altogether, sales amounted to 25,466,850 kWh, representing an increase of 8.25 per cent., while the maximum demand rose by 3.1 per cent. to 8,248 kW. These proportional increases are regarded as quite satisfactory. Valuable assistance was given by a number of large consumers who restricted their demands during peak periods in December, thus enabling the undertaking to make a lesser demand on the C.E.B. During the year 7,111,180 kWh was generated by the St. Swithin's plant (73.7 per cent. increase), 7,981 tons of coal being used. With an installed capacity of 12,000 kW, the load on the plant during December and January frequently reached 12,900 kW. The average price for all electricity sold was 0.946d. per kWh as against 0.936d. in 1934-35.

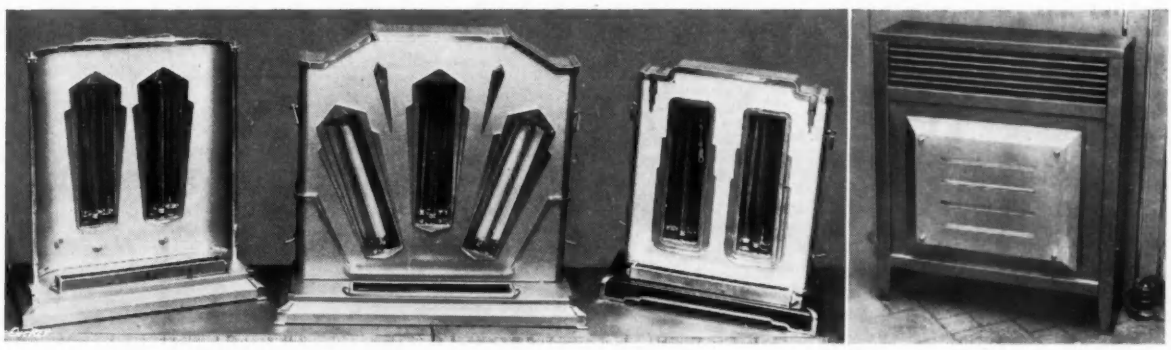
Maidstone.—EXTENSIONS.—Supplies are to be given to a new county police station and seventeen staff houses by an extension of the high-voltage main, at an estimated cost of £1,220, and also to the Malling Institution (£951).

REFRIGERATOR HIRE-PURCHASE SCHEME.—In conjunction with local electrical contractors the Corporation proposes to offer electric refrigerators to consumers on hire-purchase terms of 2s. 6d. per week for five years.

Manchester.—MAINS AND PLANT.—Sanction to borrow £350,000 for mains and £75,000 for plant has been obtained by the Electricity Committee.

Newark (Notts).—MAINS EXTENSIONS.—The Electricity Committee's recommendations that an additional high-voltage main should be laid from Queen's Road to Messrs. Ransome and Marles's works (£585), and a low-voltage main from the sub-station to Castle Gate and Stodman Street at a cost of £750, have been approved.

Pinchbeck.—SUPPLY NEGOTIATIONS.—The Parish Council has been informed that the Central Electricity Board is paying attention to the extension of the electricity supply by the Spalding Urban District Council from West Pinchbeck to Money Bridge. The estimated cost is £1,388, and the Parish Council has secured a guaranteed revenue of £180 per annum, but the Spalding Council regards this as insufficient.



Further I.M.E.A. exhibits (see pages 858 and 859): Elexcel "Floodlit" fires with tubular lamps for decoration and, right, convector with fire effect from a tubular lamp behind the shield (Greene, Phillips)

Port Talbot.—INDUSTRIAL SCHEME GOES FORWARD.—Last week the Council unanimously approved in principle the transfer of its electricity undertaking to the Town and Factories Development Co. for forty-two years, provided satisfactory assurances are given protecting the interests of the ratepayers. This step was taken in connection with the promotion of an industrial scheme on the lines of that which was recently the subject of an inquiry at Worksop, but which was not approved by the Electricity Commissioners. In a special report to the Port Talbot Council, the town clerk stated that the documents embodied a proposed tripartite agreement between the Council, the Central Electricity Board and the Town and Factories Development Co. The company would enter into an obligation to spend £40,000, in the initial stages, on estate development alone. Furthermore, sums of £250,000 and £130,000 (estimated) for extensions of the undertaking, which, without industrial development would not show a reasonable return on the investment, were to be provided immediately. The managing director of the company wrote stating that he had received communications from fourteen reputable firms which were prepared to establish light industries at Port Talbot in the event of the scheme going through.

Reigate.—LOANS.—The Corporation has applied for sanction to an additional loan of £7,000 for the alteration and replacement of consumers' apparatus owing to a change of voltage.

South Shields.—NEW CABLE.—The Town Council is to spend £3,900 on a new cable from the generating station to Barrington Street.

METERS.—Sanction is being sought to a loan of £3,000 for meters.

SUPPLY TO TYNE DOCK.—Representations have been made to the L.N.E.R. by the North-Eastern Electric Supply Co., Ltd., asking for the inclusion of a clause in the Railway Company's General Powers Bill now before Parliament so as to enable it (the E.S. Co.) to continue supplying the Tyne Dock with electricity after the dock has been transferred from the L.N.E.R. to the Tyne Improvement Commission. The Town Council is opposing this.

Stoke-on-Trent.—MAINS AND SERVICES.—The Electricity Commissioners have sanctioned the borrowing of £100,000 for mains and services; £50,000 for consumers' wiring installations; £2,250 for mains; £3,000 for the supply to the Corporation housing estate at Townsend, Bucknall; and £3,250 for supplying the Bradwell Hall Farm estate, Wolstanton.

CHANGE-OVER.—As the loan for general change-overs sanctioned by the Commissioners in August last year is almost exhausted, the Electricity Committee has decided to make application for a further loan of £15,000 for this purpose. In the meantime, it has been decided to proceed with the change-over from d.c. to a.c. in the Burslem Central area, where it is estimated that the cost of replacing consumers' apparatus will be £2,500, while the Moorland Road area of Burslem is to be changed-over at a cost of £3,500.

NEW SUPPLY.—Although it was decided last December to extend the supply to the Dundee-street area of Longton, this work has not yet been carried out. Recently, however, there have been numerous further applications for supplies in this district, and the Electricity Committee has decided to proceed with the necessary mains extensions.

WHOLESALERS' SUPPLY.—Several applications have recently been received from electrical wholesalers for supplies at contractors' showroom rates. The Electricity Committee has now considered the matter, and has decided that a supply at these rates shall be afforded to electrical firms who demonstrate lighting, heating, &c., fittings in a properly equipped showroom.

Stone.—RAPID INCREASE IN DEMAND.—Hitherto, it was thought that the equipment installed by the Electricity Department would be adequate to meet the needs of consumers until 1940, but so quickly has the undertaking grown that it has become necessary to raise fresh capital to provide new equipment. Estimates are to be obtained for the erection of a new overhead line to Strongford to take the whole of the Groundslow, Trentham, Beech and Henchurch supplies off the main line, and application is to be made to the Electricity Commissioners for a further loan of £3,000 in respect of meters.

Traction

Darwen.—NEW TRAM.—The town's first new "streamlined" tram was put into service last Saturday.

Edinburgh.—TRACK EXTENSIONS.—The Corporation has approved the extension of the tramway track in Glasgow Road, Corstorphine, between the present terminus and Turnhouse Road, at an estimated cost of £4,500.

Gloucester.—TRANSFER OF TRAMWAYS UNDERTAKING.—An agreement has nearly been completed between the Gloucester Corporation and the Bristol Tramways & Carriage Co., whereby the company is to take over the Corporation's passenger transport system for a period of twenty-one years. The draft agreement is being considered by the Corporation.

London.—CONVERSION OF WALTHAMSTOW TRAM DEPOT.—A contract has been placed with Messrs. Elkins & Co., Ltd., for the conversion of Walthamstow tram depôt for trolley-bus operation, and work will begin at once. This represents the first step toward the change-over from tram to trolley-bus operation on certain routes in the north-east of London. Trolley-buses are already running in the south-east, south, south-west and west of London, and are due shortly to commence operation in the north-west.

South Shields.—TROLLEY-BUSES.—Approval has been given by the Town Council to a proposal to introduce trolley-buses on another section of the tramway route which requires renewal. Mr. H. Muscroft, transport manager, states that trolley-buses on the Market Place-Freemantle Road route will be in operation by September. The track in Stanhope Road, which was laid down thirty years ago, would need renewing at a cost of £15,000. The route, however, could be converted for trolley-buses at a cost of £12,000, including the purchase of three vehicles.

United States.—PROPOSED SAN FRANCISCO SUBWAY.—A preliminary survey of San Francisco has been made in connection with a proposal to construct a subway, states *Mass Transportation*. It is estimated that the cost would be approximately $52,700,000, the plan embracing three routes. The existing street tramcars would be modified to run in the subway by the installation of automatic couplers, &c., the initial plan being to run two-car trains. There would be about three stations to the mile.

Communications

China.—LOAN FOR COMMUNICATION DEVELOPMENT.—The *Far Eastern Review* reports that the Nanking Ministry of Communications has been authorised to float a loan for the purpose of readjusting and developing Chinese national telegraphic, telephonic and radio communications.

India.—BROADCASTING.—It is understood that Mr. Kirke's report on broadcasting developments presented to the Government of India some time ago will be published within two months, when the Government has considered the financial implications of the proposals. As Mr. Kirke proposes the construction of a number of medium-wave transmission stations of comparatively small range, it is considered that the co-operation of provincial Governments will be necessary both financially and in regard to management. According to our Bombay correspondent, it is anticipated that a five-year programme will be drawn up, costing in all about a crore of rupees, half of which is expected to come from radio service income. The number of licences is already 30,000, and there is a regular monthly addition of 1,500. Mr. Kirke, it is stated, has also recommended a system by which amplifiers and loudspeakers in each of a group of villages would be connected by land wire with a central receiver. The Government is to install at Delhi two short-wave transmitters each costing Rs.150,000 and one short-wave transmitter at Madras. Experiments are in progress with both short- and medium-wave transmitters. The band between 40 and 100 metres is particularly favoured.

Irish Free State.—MORE POWERFUL ATHLONE TRANSMITTER.—Plans are now nearing completion for increasing the power of the Athlone broadcasting station from 50 to 100 kW, but it is not expected that the new conditions will operate until the end of the year.

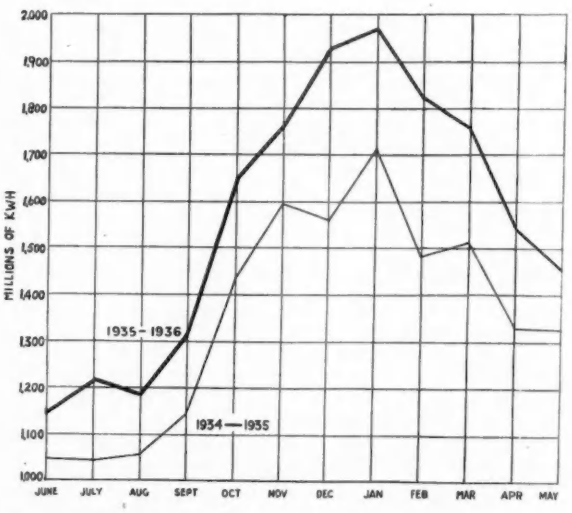
Sweden.—TELEPHONE LINE TO FINLAND.—*Reuter's Trade Service* learns from Stockholm that the Swedish and Finnish telegraph authorities are negotiating for the laying of another telephone cable between Sweden and Finland. Preparatory measures are being taken to investigate the bottom of the sea along the route chosen for the new cable.

United States.—TELEPHONES.—A *Reuter* message from New York states that there were 33,539,890 telephones in existence in the world on January 1st, 1935, of which 16,868,955 were in the United States, according to a report just issued by the American Telephone & Telegraph Company. New York City had 1,493,374 telephones, or 20.61 instruments per 100 of population, while London had only 9.59. The fifty-four cities in the United States with more than 200,000 population, taken together, had more telephones than Great Britain, Germany and France combined, the average being one telephone to every five persons.

Generation of Electricity in May

THE official returns rendered to the Electricity Commissioners show that 1,457 million kWh of electricity was generated by authorised undertakings in Great Britain during May, as compared with the revised figure of 1,327 million kWh in the corresponding month of 1935, representing an increase of 130 million kWh, or 9.8 per cent. The number of working days in the month (*i.e.*, excluding Sundays and Bank Holidays) was 26, the same as last year.

During the first five months of 1936 up to the end of May, the total amount of electricity generated by authorised undertakings was 8,558 million kWh, as compared with the revised figure of 7,357 million kWh for the corresponding period of 1935, representing an increase of 1,201 million kWh, or 16.3 per cent.



The output of authorised undertakings in the twelve months to the end of May last, with comparative curve for 1934-35

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdare.—June 23rd. U.D.C. Electricity Department. H.v. cable and switchgear. (June 5th.)

Alcester.—June 22nd. R.D.C. Vertical spindle sludge pump and a sludge elevator with electric motors, pipes, fittings, &c., at the Studley sewage disposal works. Engineer and surveyor, Bleachfield Street (deposit £2 2s.).

Ashford (KENT).—U.D.C. Electricity Department. Underground cables for one year. (June 5th.)

Barnstaple.—July 13th. Corporation. Two 450-kW Diesel-driven alternators and accessories for the Castle Street power station. (See this issue.)

Beckenham.—June 29th. Borough Council. Coal for the generating station. (See this issue.)

Blackpool.—June 16th. Borough Council. 6,600-V 3-phase compound filled metal-clad draw-out switchgear for twelve months. (May 29th.)

Bridport.—June 27th. Electricity Department. Two 1,000-kVA and three 50-kVA transformers and 6,600-V switchgear and metering equipment. (June 5th.)

Brighton.—June 15th. Corporation. One 27-panel, single bus-bar, metal-clad, draw-out type switchboard for the Southwick power station. (May 29th.)

Bristol.—July 14th. Electricity Department. Two steam-raising units. (See this issue.)

Burnley.—June 22nd. Electricity Department. Switchboard, four-switch units, three 400-kVA transformers, and h.v. cables. (See this issue.)

Chelmsford.—June 15th. R.D.C. Two vertical-spindle automatically controlled centrifugal crude sewage pumps and electric motors, with accessories, at the Runwell sewage pumping station. W. E. Blizard, 25, Victoria Street, London, S.W.1 (deposit £3 3s.).

Dartford.—June 29th. Borough Council. Street lighting columns and lanterns, time switches and cases and brackets and lanterns. (See this issue.)

Devizes.—June 19th. R.D.C. Three electrically driven, automatically controlled borehole pumping sets, each consisting of a borehole and a booster pump. Parker Pearson & Ross Hooper, Dallas Chambers, Chippenham, Wilts (deposit £1).

Douglas (I. of M.).—June 26th. Electricity undertaking. 3,750-kW turbo-alternator, &c. (May 29th.)

East Grinstead.—June 24th. U.D.C. Switch and ring-main units. (See this issue.)

East Retford.—June 24th. Electricity Department. L.v. switchgear. (See this issue.)

East Riding.—June 22nd. County Council. Replacement of existing heating boilers at the County Hall, Beverley, by (a) low-pressure hot-water boilers for various methods of firing, or (b) electrical thermal storage. County architect, County Hall, Beverley (deposit £2 2s. each).

Edinburgh.—June 13th. Corporation. Electric lighting in 232 houses at Granton Mains housing estate. Engineer's office, Dewar Place (deposit £1 1s.).

Egypt.—ALEXANDRIA.—June 27th. Ports and Lighthouses Administration. Electrification of the Port of Alexandria (3rd section). Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1 (deposit £2 1s., not returnable).

Erith.—June 23rd. U.D.C. Electricity Department. Three 500-kVA three-phase, outdoor type transformers, l.v. distribution panels and h.v. switches for sub-stations; alterations to main cabling at Walnut Tree Road Station; and cable for l.v. main connections at sub-stations. (June 5th.)

Essex.—July 6th. County Council. Public Health and Housing Committee. Electrical installations at the Black Notley Sanatorium extensions. (See this issue.)

Gainsborough.—June 13th. Electricity Department. One 400-kVA, 6,600/400-V transformer. (May 29th.)

Gellygaer.—June 26th. U.D.C. H.v. and l.v. cables, steel kiosk, h.v. switchgear, transformer, copper conductors, wood poles and meters. (June 5th.)

Guildford.—June 23rd. Corporation. H.v. and l.v. overhead lines at Wood Street. (See this issue.)

Halifax.—June 16th. Housing Committee. Various works, including electrical, at thirty-six flats at South Street (Contract No. 1) and 330 houses and fifty bungalows on the Park Lodge estate (Contract No. 2). D. T. Lloyd Jones, borough engineer, Crossley Street (deposit £2 2s.).

Hull.—June 16th. Education F. and G.P. Sub-Committee. Electrical installations in the junior departments of the Hall Road and Maybury Road schools. D. Harvey, city architect, Guildhall (deposit £1 1s.).

June 18th. Electrical installations at the Remand Home, East Hull. D. Harvey (deposit £1 1s.).

India.—SIMLA.—July 16th. Stores Department. Electrically driven facing and re-turning machine and spares for the G.I.P. railway. (T. 30313.)*

Irish Free State.—DUBLIN.—June 18th. Commissioners of Public Works. Central heating, hot water, cooking and electrical equipment at Colaiste Eirne, Galway. T. Cassedy, Office of Public Works (deposit £3).

June 19th. Electricity Supply Board. Meters during one year commencing September 1st next. (May 29th.)

Lanark.—County Council. Electrical installations at the new Health Institute and Library, Bellshill. J. Stewart, county architect, 32-36, Albert Street, Motherwell, by June 13th.

Leeds.—June 16th. Education Committee. Electric lighting at Gipton Council school. G. Guest, director of education, Education Offices.

June 19th. Health Committee. Re-wiring and re-tubing of the electric lighting installation at Blocks A and B, St. James' Hospital. J. E. Acfield, city engineer, Civic Hall.

Lincoln.—June 26th. Electricity Department. Three 300-kVA and three 200-kVA oil-immersed transformers. (See this issue.)

London.—METROPOLITAN WATER BOARD.—June 15th. Electric lamps for twelve months commencing August 1st next. Chief engineer, Room 171, 173, Rosebery Avenue, London, E.C.1.

June 19th. Commissioners of H.M. Works. Steel conduits and fittings for electric wiring. (June 5th.)

STOKE NEWINGTON.—July 1st. Borough Council. Rising mains in the Coronation Avenue and Imperial Avenue flats. (See this issue.)

ST. PANCRAS.—July 9th. Electricity Department. P.i., l.c. cables, prepayment meters, meter boards and cooking stoves, fires, wash-boilers and water-heaters for twelve months commencing August 1st next. (See this issue.)

Manchester.—June 20th. Electricity Committee. Fire extinguishing equipments at the Barton and Stuart Street stations, passenger and goods lift for the Barton station and three 250-kW mercury-arc rectifier equipments. (June 5th.)

July 11th. Assize Courts and Judges' Lodgings Committee. Electric lighting fittings at the Civil and Crown Courts and other rooms at the Courts. D. D. Boliver, steward, Assize Courts.

Middlesex.—July 6th. County Council. Electrical installations comprising distribution cable, lighting, power, clocks, ward and staff signalling systems, and heating and cooking at the Hillingdon County Hospital extensions. (June 5th.)

Newark.—Town Council. Wiring of sixty-eight houses on the Hawtonville housing estate. Borough electrical engineer, Electricity Department.

New Zealand.—WELLINGTON.—July 7th. Public Works Department. Diesel-electric generating set and switchgear. (T.Y. 30281.)* One deep well pump with electric motor-driven power head, automatic starter, &c. (T. 30280.)*

August 11th. Public Works Tender Board. Seven 110-kV oil-immersed circuit-breakers. (T.Y. 30302.)*

NEW PLYMOUTH.—August 27th. Harbour Board. One 2-ton electric level luffing, portal, travelling jib crane and spares. (T. 30279.)*

Northern Ireland.—BELFAST.—June 13th. Electricity Committee. Steam pipework, armour-clad switchgear, static transformers and town water service main. (May 29th.)

June 23rd. Town Council. Closed circuit, self-testing, code signalling street fire alarm system, comprising 110 call points with associated apparatus at headquarters and branch stations. Chief officer, Fire Brigade Headquarters.

Poole.—June 13th. Town Council. Electrically driven centrifugal unchokeable type sewage pumps (400 gal. lift against a head of 100 ft.), with motors in duplicate, for the Wallisdown sewerage. E. J. Goodacre, borough engineer, Municipal Buildings (deposit £1 1s.).

Portsmouth.—July 3rd. Electricity Undertaking. Two 100-kW rectifier sets. (See this issue.)

Roxburgh.—June 17th. County Council. Electrical tubing at Morebattle (New) schoolhouse. County clerk, County Offices, Newtown St. Boswells (deposit 10s. 6d.).

Saltcoats (AYRSHIRE).—June 22nd. Town Council. Electric lighting at seventy-two houses. R. Rennie, 23, Bradshaw Street (deposit £1 1s.).

Sheffield.—July 1st. Electricity Committee. Steam and water piping, including steam receivers, valves, &c., for the Neepsend generating station. (May 29th.)

South Africa.—CAPE TOWN.—July 1st. Electricity Department. 2,000 25-A single-pole, iron-clad service cut-outs. (T.Y. 30271.)* Street lighting fittings and spares, fly fuses, line taps, insulators, &c. (T. 30272.)*

July 15th. One l.v., a.c., iron-clad switchboard. (T.Y. 30310.)*

Southampton.—June 23rd. Electricity Department. Domestic electric cookers. (See this issue.)

Stretford.—June 15th. Corporation. Sewage, storm water and sludge pumps with electric motors, starters, &c., and screening plant, grab and gantry. E. Parker, borough engineer (deposit £2 2s.).

Sutton Coldfield.—June 17th. Electricity Committee. E.h.v. and l.v. switchgear, transformer kiosks and transformers. (June 5th.)

Tredegar.—June 20th. U.D.C. Pole lines, underground cables, switchgear, and a 250-kVA transformer. (May 29th.)

West Riding.—June 29th. County Council. Electric lighting at Pontefract Girls' High school and electric lighting and heating at Selby School of Art. Education Officer, County Hall, Wakefield.

June 15th. Public Assistance Committee. Wireless apparatus at Keighley and Wakefield Institution; automatic refrigerating plant at Keighley Institution; and extension of electric lighting to casual block at Skipton Institution. P. O. Platts, architect, County Hall, Wakefield.

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*Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Australia. — COMMONWEALTH.—P.M.G.'s Department. Accepted. Dial parts.—Standard Telephones & Cables (A'sia), Ltd. (£1,532); British General Electric Co. (£242). Electron tubes and sockets.—Standard Telephones & Cables (A'sia), Ltd. (£5,008); Philips Lamps (A'sia), Ltd. (£593); British G.E.C. (£539). Resistances, reactances and coils.—Standard Telephones & Cables (A'sia), Ltd. (£2,128); Automatic Telephones, Ltd. (£308). Handsets.—Ericsson Telephone Mfg. Co. (£465); Siemens (Aust.) Pty., Ltd. (£589); Automatic Telephones, Ltd. (£561). Carrier maintenance parts.—Standard Telephones & Cables (A'sia), Ltd. (£872); British G.E.C. (£210). Automatic telephone switching equipment—Automatic Telephones, Ltd. (£571 and $318,794); Siemens (Aust.) Pty., Ltd. (£23,074); British G.E.C. (£1,199).

Department of Defence. Accepted. Submarine electric cable. —Liverpool Electric Cable Co.

VICTORIA.—State Electricity Commission. Accepted. Compound-filled switchgear (£3,884).—A. Reyrolle & Co.—*Tenders.*

Birmingham.—Corporation. Accepted during the period from January 4th to May 22nd, 1936:—

Baths Committee. Electric lighting installation at the new public bathing establishment, Northfield.—Reynolds & Bradwell.

Gas Committee. Installation and maintenance of an automatic telephone exchange at the gas meter and stove stores, Lord Street.—Reliance Telephone Co.

Assistance Committee. Electrical bed lift in the extensions at Quinton Hall Institution.—Pickerings, Ltd. Electric lighting, power, electric bells and fire alarms in the extensions at Quinton Hall Institution.—Reynolds & Bradwell.

Salvage Committee. Electric vehicle batteries for one year from April 1st, 1936.—D.P. Battery Co.; Chloride Electrical Storage Co.; Britannia Batteries, Ltd.; Tudor Accumulator Co.

Health Committee.—Electrically driven lift at Sorrento Maternity Home, Moseley.—Evans Lifts, Ltd.

Electricity Committee. Five sets of metal-clad switch panels for consumers' electricity sub-stations.—Switchgear & Cowans, Ltd. Four motor convertors and one set of spares for the Summer Lane power station.—G.E.C. Three motor convertors at Dale End sub-station.—Bruce Peebles & Co. Two boiler units at Hams Hall power station.—International Combustion, Ltd. Two centrifugal oil purifier units at Hams Hall station.—Hopkinsons, Ltd. Battery repairs at Court Road and Dale End sub-stations.—Tudor Accumulator Co. Conduits for twelve months from January 1st last.—Callender's. Circuit-breakers.—Ferguson, Pailin, Ltd.

Blackpool.—Transport Committee. Accepted. Mercury-arc rectifier plant.—Hewittic Electric Co.

Electricity Committee.—Accepted. Meters for twelve months.—Aron Electricity Meter; British Electric Meters; Ferranti, Ltd.; Landis & Gyr; Measurement, Ltd.

Bradford.—Electricity Committee. Accepted. H.v. switchgear for the Valley Road power station (£26,618).—A. Reyrolle & Co.

Chichester.—City Council. Accepted. Cable for extensions between Ashling Road and Funtington (£2,160); for cable laying from Ashling Road to Westmead (£4,144), and from Northgate to Portfield (£6,940).—Hackbridge Cable Co. Switchgear for Northgate sub-station.—New Switchgear Construction Co.

Dumfries.—Corporation. Accepted for new slaughter house. Appliances.—North British Lifting and Moving Appliance Co. Refrigerator plant.—L. Sterne & Co.

Corporation. Accepted. One additional h.v. oil switch (£110).—A. Reyrolle & Co. H.v. ring-main switch (£148).—Met.-Vick. Elecl. Co. Two 250-kVA transformers (£216).—Brush Elecl. Engg. Co. Four-panel h.v. switchboard (£246).—Ferguson, Pailin, Ltd.

Dundee.—Housing Committee. Recommended. Electric lighting installation at Balgay housing estate (£125).—J. A. Hackney. Electrical installations at Queen Street estate (£224).—Stenson & Co.

Liverpool.—Passenger Transport Committee. Accepted. One set of tramcar motors and remote control equipment (£842).—Crompton Parkinson, Ltd.

Manchester.—Electricity Committee. Accepted for twelve months: Lamp shades.—C. Quitman; Hailwood & Ackroyd, Ltd. Service cut-outs.—Parmiter, Hope & Sugden; Siemens Electric Lamps & Supplies. Static transformers.—Ferranti, Ltd. 6,600-V switchgear at the Brown Street sub-station.—Ferguson, Pailin, Ltd.

Watch Committee. Accepted. Electric lighting and power installations at new police headquarters.—H. C. Taylor & Co.

Health Committee. Accepted. Electric compressor pump.—G.E.C.

Middlesex.—With reference to the note which appeared under this heading in our last issue for the electrical installation at Redhill Hospital, we regret that Messrs. Phillips & Sons, Electrical, Ltd., were omitted from the list of tenderers; their offer was £19,934.

Rugby.—Town Council. Accepted. 400-yd. l.v. cable (£116), frames and covers.—Henley's. 400-yd. h.v. cable (£189), joint and disconnecting boxes.—B.I. Cables, Ltd. Two 250-kVA transformers (£397).—English Electric Co. Switchgear (£52), and switchboard (£220).—B.T.H.

Sheffield.—Health Committee. Accepted. Wireless installations at Winter Street Hospital (£116).—J. Riley & Sons. Internal telephones (£180).—J. W. Rippon.

Electricity Committee. Accepted. Reinforced concrete cooling tower at Neepsend power station (£29,360).—Mitchell Engineering Co.

Transport Committee. Accepted. Traction lamps, &c.—R. Neill & Co. (Sheffield), Ltd.; J. Riley & Sons. Cable.—R. Neill & Co. (Sheffield), Ltd.; E. Kalker & Co. Armature coils.—Manchester Armature Repair Co.; Met.-Vick. Elecl. Co. Assembled commutators.—Met.-Vick. Elecl. Co.

Forthcoming Events

Institution of Electrical Engineers.—Monday, June 15th, to Saturday, June 20th. Summer meeting in Scotland.

London Students' Section.—Saturday, June 13th. Summer visit to the Rothamsted all-electric farm, Harpenden.

Hampshire Sub-Centre.—Thursday, June 18th. Summer visit to the Portsmouth electricity undertaking and Shippam's potted meat factory, Chichester.

South Midland Centre.—Tuesday, June 30th. Summer meeting. Visits to the works of the British Thomson-Houston Co., Rugby, and the Shakespeare Memorial Theatre, Stratford-on-Avon.

Institution of Civil Engineers.—Tuesday, June 16th. Institution, London, S.W.1, 6 p.m. Lecture on "The Development of the Sao Paulo Hydro-Electric Scheme" by Mr. A. W. K. Billings.

Chemical Engineering Congress.—Monday, June 22nd, to Saturday, June 27th. Central Hall, London, S.W.1.

Institution of Heating and Ventilating Engineers.—Monday, June 22nd, to Wednesday, June 24th. Cliftonville, Margate. Summer meeting. "Heating Research." Mr. A. F. Dufton.

Notes

Standard Specification for Conductors

A new specification (B.S.S. No. 672) for hard-drawn cadmium-copper solid and stranded circular conductors for overhead power transmission purposes has been prepared at the request of the Copper Development Association, and follows as closely as possible the form of the previous issues in the series. It deals with definitions; standards for the cadmium-copper, such as resistance, density, &c.; a specification of the conductors, including standard sizes, weights, resistance, mechanical properties and tests; together with comprehensive tables. Copies can be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d., post free.

B.S.I. Annual Meeting and Luncheon

The annual general meeting of the British Standards Institution was held in London on June 4th under the chairmanship of Mr. W. Reavell. Mention was made of the forthcoming visit of the director to New York and Argentina in connection with the work of the newly-formed Argentine Institute for the Rationalisation of Materials. At the luncheon which followed the meeting Lord Riverdale, the chief guest, in proposing the toast of the Institution, referred to the very economic manner in which the work was carried out, dealing as it now does with some 800 committees and over 1,000 meetings in the course of a year. Mr. Reavell, the retiring chairman, having thanked Lord Riverdale for his aid in the past, said that perhaps they might persuade him to help them once more when the Government was approached for an increase in the grant to this great national work. Mr. E. J. Elford, chairman for the forthcoming year, proposed the toast of "Those Associated with the B.S.I.," to which Mr. S. Tatchell, chairman of the Building Industries National Council, responded.

A.S.E.E. Visits

The Manchester and District Branch of the Association of Supervising Electrical Engineers has recently paid a visit to the cable works of Messrs. W. T. Glover, Ltd., at Trafford Park, Manchester. Other visits arranged are:—June 20th, Manchester Docks; July 4th, Mersey Tunnel, Liverpool (ventilating and control plant).

The British Foundry School

The British Foundry School commences its second session in October, 1936, and a course of one year's instruction is provided. The total number of students taking the course for the first year, which opened in October, 1935, is thirteen, and they are now in their final term. The examination for the diploma will take place in July, and it is anticipated that this will receive the endorsement of the Board of Education. Entries for the next session, 1936-37, can now be received, and application forms may be obtained from the Secretary of the School, Central Technical College, Suffolk Street, Birmingham, 1, or from Mr. J. G. Pearce, Honorary Treasurer, 21-23, St. Paul's Square, Birmingham, 3.

Appointments Vacant

Technical assistant (installations) for Cardiff Electricity Department.

Mains assistant, linesman and domestic apparatus assistant for the North West Midlands J.E.A.

Electrical engineers for the Irish Free State Electricity Supply Board.

Civilian technical officers for the Department of Scientific Research, Admiralty Technical Pool.

Assistant to the chief mechanical engineer at the Royal Naval Cordite Factory, Holton Heath, Dorset.

Assistant II in the Admiralty Scientific and Technical Pools.

Assistant engineer for the Government of Nigeria.

Examiners in the w/t and instrument sections of the Air Ministry, Aeronautical Inspection Directorate.

Electrical engineering assistants in the drawing office of the Air Ministry.

Lady demonstrator and showroom assistant for Crewe Electricity Department.

Control room operators for the Fulham power station.

Assistant constructional engineer for Belfast Electricity Department.

Junior scientific officer (civilian), Admiralty Scientific Pool.

Technical officer (civilian), Admiralty Technical Pool.

(See our classified advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

LIFETIME motors.

Porcelain-lined kettles.

PORRITT electric sander.

V.P. air circuit-breakers.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. J. L. Sayers, of the Eastbourne Corporation Electricity Department, has secured an appointment with the Watford Corporation Electricity Department. He has been with the Eastbourne Mains Department for fifteen years.

Mr. W. Frisby, M.I.E.E., borough electrical engineer, Colchester, is retiring on superannuation on September 30th, having completed forty years' service with the Colchester Corporation, and the Electricity Supply Committee has resolved that the Standing Sub-Committee be asked to consider the question of filling the vacancy. Mr. Frisby was educated at Westbourne School, the Polytechnic, London, and the Technical Schools, Manchester. He served his apprenticeship with Messrs. W. T. Goolden & Co., and was subsequently switchboard attendant at Brighton. Later he was appointed chief assistant electrical engineer at Stockport, and left there to take up a similar position with the Colchester Corporation, being appointed to his present position of borough electrical engineer in 1910.

[*Elliott & Fry*

Mr. W. Frisby

Mr. H. Hepworth Thompson has resigned from the boards of the English and French Holophane Companies as from June 30th, after which date correspondence should be addressed to him at the Reform Club.

Mr. T. Perks, of the staff of the Chasetown & District Electricity Co., who was recently married to Miss C. M. Richards, has been presented by his colleagues with an electric clock.

Mr. D. S. Munro, M.I.E.E., **Mr. A. Lindsay,** M.I.E.E., and **Prof. S. Parker Smith,** M.I.E.E., have been elected life members of the Electrical Industries Benevolent Association.

Mr. H. I. Yarwood, A.M.I.E.E., eldest son of Mr. G. Yarwood, of Moseley, Birmingham, was married at Dudley on May 23rd to Miss E. M. Osborn.

Mr. A. F. Plummer, M.C., managing director of the Shoolbred Electrical Co., Ltd., of Luton, was married on June 6th to Miss E. K. Gridley.

Mr. B. S. Hornby, chief assistant engineer to the Bolton Corporation Electricity Department, has tendered his resignation to operate from the end of June. He has been with the Department for thirty-seven years.

Dr. E. Mallett has been elected chairman of the Wireless Section of the Institution of Electrical Engineers for the 1936-37 session.

Mr. F. J. Skoyles, who has for over forty years been engaged at the Great Yarmouth Corporation electricity works, has retired, and has been presented by the staff and employés with an electric standard lamp.

Mr. W. Griffith, of the staff of the mains surveyor's section of the Manchester Corporation Electricity Department, who was recently married to Miss G. M. Seddon, has been presented by his colleagues with a pewter tea set.

Mr. W. Johnstone informs us that he has resigned from the board of the Brush Electrical Engineering Co., Ltd. His association with the company has covered a business lifetime and goes back to the earlier days of central power station equipment and the various forms of transport for which the Brush Co. has always been noted. He was managing director for many years under the chairmanship of the late Mr. Emile Garcke.

Mr. F. R. Davenport has also resigned from the board of the Brush Electrical Engineering Co., Ltd.

The Association of Supervising Electrical Engineers announces the winners of the meetings discussion award for the 1935-36 session. In the members' section **Mr. J. Southern** received the first prize of £5 and **Mr. W. Acton** the second prize of £2 10s. The associates' prize of £2 10s. was secured by **Mr. C. R. D. Morse.** The proportion of marks secured by the successful competitors was higher than on any previous occasion, the winner of the members' first prize securing 86 per cent. of the possible marks.

Miss Barbara M. Ketèlbey, daughter of Mr. and Mrs. F. G. Ketèlbey, of Kelmscott Road, Harborne, was married on Saturday last, at Harborne Parish Church (St. Peter's), Birmingham, to Mr. A. L. Smallwood, of Hall Green, Birmingham. The wedding is one of both electrical and musical interest, for the bride's father, Mr. F. G. Ketèlbey, A.M.I.E.E., is a relative of the well-known musical composer of that name. Mr. Ketèlbey was for many years with the B.T.H. Co. at Rugby and Birmingham, and for the past twelve years has been in business on his own account in Birmingham. Mr. Smallwood is a director of the Forward Engraving Co., Birmingham.

Mr. J. Bowthorpe, who was formerly sales manager of the Electrical Equipment & Carbon Co., Ltd. (now in liquidation), has been appointed sales director of Goodliffe Electric Supplies, Ltd., the registration of which is recorded in our "New Companies" section.

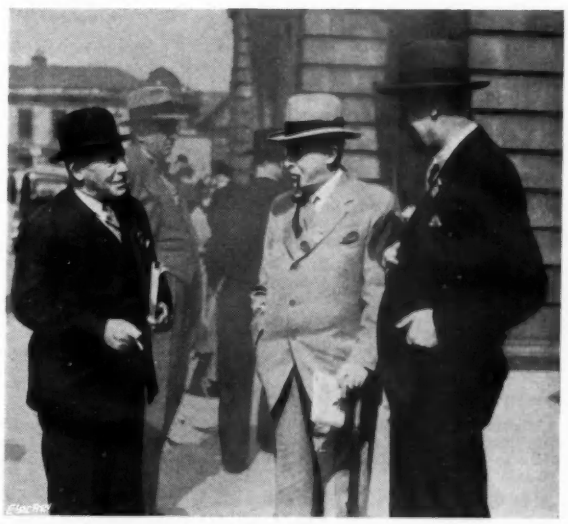
Mr. F. A. Gaby, who was chief engineer to the Hydro-Electric Power Commission of Ontario from 1912 until 1934, when he joined the Canadian Pacific Railway, has been appointed executive vice-president of the British American Oil Company.

Mr. W. O. Smith has resigned from the board of Messrs. Siemens Bros. & Co., Ltd.

Engr. Rear-Admiral J. Hope Harrison, R.N. (Retired), one of the joint honorary secretaries of the Diesel Engine Users' Association, has resigned, and **Mr. A. T. Hobbs,** M.Inst.C.E., has been appointed secretary by the Association Committee. Mr. Hobbs, who is also secretary of the Institution of Water Engineers and of the Institution of Highway Engineers, has already taken up his duties.

Mr. L. R. John, chief assistant to Mr. R. E. Robson, of Messrs. Robson & Coleman, was married at All Saints Church, Gosforth, Northumberland, on June 9th, to Miss Mary Enid Robson, Mr. Robson's youngest daughter.

Mr. H. B. Tilley, A.M.I.E.E., who recently retired from Marconi's Wireless Telegraph Co., Ltd., after twenty-five years' service, was presented on June 2nd with a silver salver, suitably inscribed, from the employés of the Chelmsford works. The presentation was made by Mr. H. Ewen, works manager.



Messrs. A. Nichols Moore (Newport), R. W. L. Phillips (Bedford), and F. W. Purse (London J.E.A.) at the Edinburgh Convention

Mr. W. C. P. Tapper, who was president of the Incorporated Municipal Association in 1924-25 and who has since acted as honorary secretary, has been elected an honorary member of the I.M.E.A. in recognition of his services.

Mr. H. J. Seale, chief electrical engineer of the Great Indian Peninsula Railway, has been granted two years' leave, as from April 9th last, prior to retirement.

Obituary

Dr. Ing. W. Kohlrausch.—The death is reported from Hanover, at the age of eighty years, of Dr. Ing. Wilhelm Kohlrausch, for many years professor of electrotechnics at the Hanover Technical High School, and well known for his work in connection with lead batteries.

Mr. Charles Richardson, who died on May 30th, at the age of seventy-three years, at Beeston Cliffe, Runton, near Cromer, was the founder of the firm of Messrs. Charles Richardson & Sons, electrical engineers, of Romiley, Stockport.

Wills.—Mr. J. Spence, of the British Electrical & Manufacturing Co., Ltd., left £8,093 (net personalty £6,525).

Sir John Cunningham McLennan, F.R.S., Emeritus Professor of Physics at the University of Toronto, left estate in England of the gross value of £9,732 (net personalty £4,545). He left his scientific books and instruments to the University of Toronto for use in the McLennan Laboratory, $5,000 to the University for scientific research work in the McLennan Laboratory, and also the painting of himself by Augustus John.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Elmeco Sales, Ltd.—Private company. Registered June 3rd. Capital, £100. Objects: To carry on the business of manufacturers, importers and exporters of and dealers in and contractors for the sale, letting on hire, installation and maintenance of plant and machinery operated by light-sensitive cells of the selenium, photo-electric or any other type for wireless, magnetic, electrical, television and radio apparatus, &c. The subscribers are: H. F. Cornish, 1, Gray's Inn Square, London, W.C.1, solicitor, and G. F. Salas, 15, Hanover Buildings, Thomas Street, W.1, journalist. The directors' borrowing powers are restricted to £25,000. Registered office: 262/282, Waterloo Road, London, S.E.1.

Radio Mart, Ltd.—Private company. Registered June 3rd. Capital, £100. Objects: To acquire the business of radio dealers carried on by R. Brown at 411, Green Lanes, Harringay, London, N.4, as "Radio Mart." The directors are: R. Brown, 63, Upper Street, Islington, N.1, and S. Penikoff, 144, Hanbury Street, E.1. Registered office: 411, Green Lanes, Harringay, N.4.

Goodliffe Electric Supplies, Ltd.—Private company. Registered June 2nd. Capital, £2,000. Objects: To carry on the business of manufacturers and sellers of electrical goods, wireless goods, appliances and accessories, television instruments, appliances and accessories, &c. The directors are: F. W. Goodliffe, 303, Beulah Hill, Norwood, London, S.E.19, and three others. Secretary: G. F. W. Goodliffe. Registered office: 8, Eagle Street, High Holborn, London, W.C.1.

Scottish Radio Rentals, Ltd.—Private company. Registered in Edinburgh June 3rd. Capital, £100. Objects: To carry on the business of manufacturers, importers and exporters of and dealers in receivers or other apparatus for the reception of sound or vision, &c. The directors are: J. C. Walker, 6, Alva Street, Edinburgh; and H. C. Ruffle, 12, Traquair Park West, Corstorphine, Edinburgh. Registered office: 6, Alva Street, Edinburgh.

John Roberts (Manchester), Ltd.—Private company. Registered June 4th. Capital, £10,000. Objects: To carry on the business of makers and repairers of and dealers in electrical and/or chemical appliances and goods, &c. The directors are: J. Roberts, 5, Sandileigh Avenue, Withington, Manchester, and two others. Registered office: 1/3, Bridgewater Viaduct, Knott Mill, Manchester, 3.

Conway, James & Co., Ltd.—Private company. Registered June 4th. Capital, £500. Objects: To carry on the business of manufacturers of and dealers in electrical and mechanical appliances, gramophones, &c. The directors are: Miss V. Read, Tudor House, Roding Lane, Ilford; and Wm. Smedley, 35, York Road, Woking. Registered office: 23, Church Street, Camberwell, S.E.5.

M. Calderon, Ltd.—Private company. Registered June 5th. Capital, £3,000. Objects: To carry on the business of manufacturers of and dealers in electrical and wireless apparatus, &c. The subscribers are: R. Lye, 16, Godliman Street, London, E.C.4; and M. Calderon, 3, Eden Street, N.W.1. Secretary (*pro tem*): G. Ogilvie Mitchell. Registered office: 3/4, Eden Street, N.W.1.

Wireless Manufacturers, Ltd.—Private company. Registered June 5th. Capital, £5,000. Objects: To carry on the business of manufacturers of and dealers in wireless apparatus, &c. The directors are: J. E. Bell, "Thilawa," Duchy Road, Harrogate; and J. A. Hartley, "The Oaks," Shadwell Walk, Moortown, Leeds. Solicitors: Hepworth & Chadwick, 14, Butts Court, Leeds.

John W. Mutlow, Ltd.—Private company. Registered June 5th. Capital, £1,000. Objects: To acquire the business of a metal worker now carried on by J. W. Mutlow as "John W. Mutlow" at 15, Chitty Street, London, W.1, and to carry on the business of manufacturers of electric light fittings, vase mountings, bronze works, &c. The permanent directors are: J. W. Mutlow and G. C. Mutlow, 36, Kenton Gardens, Kenton, Middlesex. Registered office: 15, Chitty Street, London, W.1.

Returns of Electrical Companies

Barratt & Co. (Blackburn), Ltd.—Debenture, dated May 23rd, 1936, to secure £300, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: S. Barratt and Miss M. M. Barratt, both of 66, Taylor Street, Blackburn.

A. E. Morrison & Sons, Ltd.—Satisfaction in full on April 9th, 1936, of charge dated January 31st, 1934, and registered February 12th, 1934. (According to the register of mortgages, the only charge registered February 12th, 1934, was a mortgage which originally secured all moneys due to bank.)

Durion, Ltd.—The nominal capital has been increased by the addition of £500 in £1 ordinary shares beyond the registered capital of £2,200.

Grimston Electric Tools, Ltd.—The nominal capital has been increased by the addition of £2,500 in £1 ordinary shares beyond the registered capital of £5,000.

Electrical Trading Association, Ltd.—Capital, £10,000 in £1 shares. Return dated January 14th, 1936. 2,502 shares taken up. £2,502 paid. Mortgages and charges, nil.

Electric Lamp Service Co., Ltd.—Capital, £2,000 in £1 shares. Return dated January 14th, 1936. All shares taken up. £2,000 paid. Mortgages and charges, nil.

Capels Wholesale Wireless Co., Ltd.—Capital, £6,000 in £1 shares. Return dated February 21st, 1936. 4,500 shares taken up. £1,500 paid, £3,000 considered as paid. Mortgages and charges, nil.

B.E.I., Ltd.—Capital, £1,000 in £1 shares. Return dated March 4th, 1936. All shares taken up. £1,000 paid. Mortgages and charges, nil.

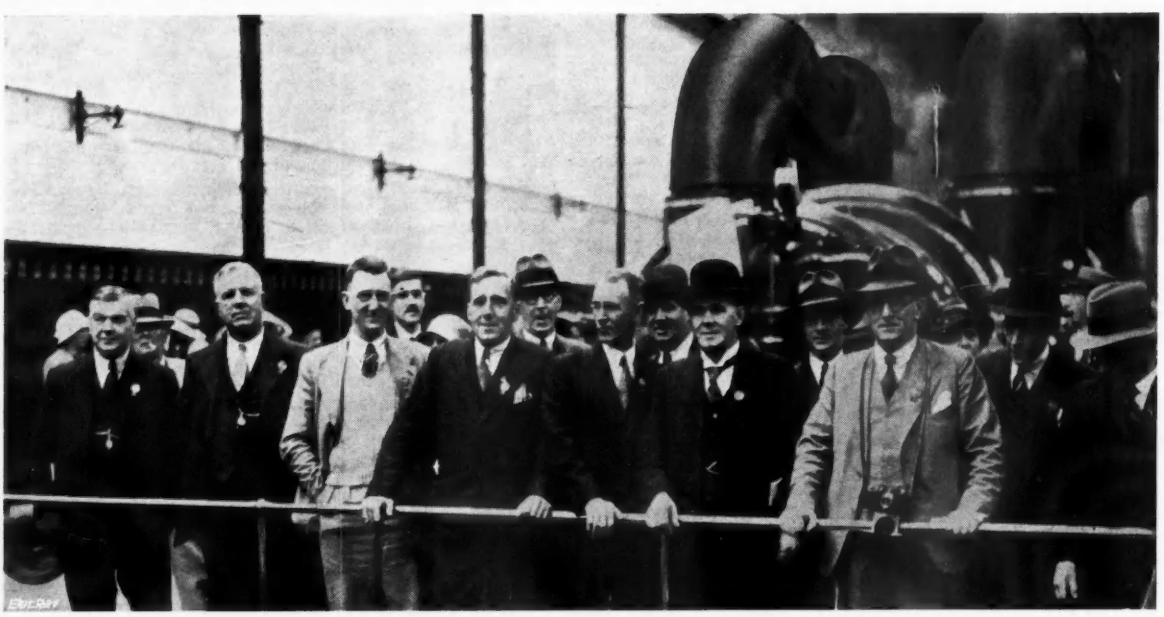
Painter Bros., Ltd.—Capital, £40,000 in 30,000 ordinary shares of £1 and 8,000 "B" ordinary and 12,000 5 per cent. cumulative preference shares of 10s. Return dated March 27th, 1936. 30,000 ordinary and 12,000 preference shares taken up. £36,000 paid. Mortgages and charges: £29,000 (loan secured by debentures).

B. & E. Battery Co., Ltd.—A. J. Gray, of 10, Neville Street, Newcastle-on-Tyne, ceased to act as receiver on May 28th, 1936.

Earl Manufacturing Co., Ltd.—C. H. I. Chown, of 23, Bush Lane, E.C.4, ceased to act as receiver and manager on December 19th, 1935. (Notice filed May 29th, 1936.)

Aurora Battery Co., Ltd.—Capital, £100 in £1 shares. Return dated December 31st, 1935 (filed March 28th, 1936). Two shares taken up. £2 paid. Mortgages and charges, nil.

Kolhapur Hydro-Electric & Aluminium Co., Ltd.—Capital. £100 in £1 shares. Return dated December 31st, 1935 (filed March 16th, 1936). Seven shares taken up. £7 paid. Mortgages and charges, nil.



A group of I.M.E.A. delegates at the Portobello power station on Tuesday afternoon

Steriphone Co., Ltd.—Capital, £1,000 in £1 shares. Return dated May 5th, 1936. 902 shares taken up. £402 paid. £500 considered as paid. Mortgages and charges, nil.

Electrical Name & Numerical Sign Co. (1931), Ltd.—Capital, £100 in 2,000 shares of 1s. Return dated January 10th, 1936. All shares taken up. £100 paid. Mortgages and charges, nil.

R. Russell (Electrical), Ltd.—Capital, £2,000 in 1,500 preference shares of £1 and 2,000 ordinary shares of 5s. Return dated January 14th (filed April 28th), 1936. 553 preference and 700 ordinary shares taken up. £328 paid on 153 preference and 700 ordinary shares. £400 considered as paid on 400 preference shares. Mortgages and charges, nil.

N. E. Radio Relay Services, Ltd.—Capital, £10,000 in £1 shares. Return dated January 13th, 1936. 3,000 shares taken up. £3,000 paid. Mortgages and charges, £4,000.

City Notes

Whitehall Electric Investments, Ltd., held its annual meeting on June 4th, when the Hon. Clive Pearson (chairman), who presided, said that the Athens Piræus Electricity Co. had achieved good results during the past year. The number of consumers connected had risen by 11,000 to 121,000 and the sales by 11,000,000 kWh to 103,000,000 kWh. The drachma earnings had consequently grown, but inability to secure sterling exchange, despite the unequivocal right of transfer guaranteed by the concession, deprived the shareholders of any corresponding benefit. Exchange restrictions also hampered the due maintenance and development of the undertaking, with the result that towards the end of the year they were obliged to refuse potential new consumers in areas where the network had become overloaded. In Spain, operations of the Lecrin Co. had also improved, and although sales to mining companies were still low, the number of small industrial concerns taking power was increasing. Consumers at the close of the year numbered 20,000 and sales amounted to 17,000,000 kWh, an increase of 56 per cent., due mainly to the bulk sales to the Electricity Company of Granada. The West of England Co., which controlled ten companies supplying 1,500 sq. miles in Devon and Somerset, had modernised and extended the undertakings, and progress was being made by linking them together and carrying the transmission and distribution system to outlying places. During 1935 over 4,000 new consumers were added, and sales rose by 25 per cent. to 15,500,000 kWh. The increasing sales had, as in past years, been accompanied by a reduction in the average price per kWh.

The Electric Furnace Co., Ltd., reports a net profit for the year ended March 31st last of £24,491, as compared with £14,339 in the preceding year, to which is added £955 brought in, making £25,447. It is proposed to place £7,500 to reserve and to pay a final ordinary dividend of 4½ per cent., maintaining the distribution for the year at 7 per cent. The balance carried forward is £4,946. The report states that the company has had a busy year, the volume of orders received being in excess of that of any previous year in its history. The full benefit of the increased turnover is not reflected in the year's accounts, as a large proportion of the orders was still in progress on March 31st. Although work was mainly for British manufacturers, orders were also received from France, Belgium, South Africa, Holland, Sweden, China and Japan. The orders were well divided among the different metal industries, and there was a substantial revival of interest in electric arc furnaces. During the year the rights in a new process for the heat treatment by induction of crankshafts and similar objects have been obtained, and a plant will shortly be in operation in Sheffield. The subsidiary company made a profit last year, and substantial technical progress resulted in an increased volume of orders. A pension scheme has been put into operation. Meeting: June 16th.

The Ever Ready Co. (Great Britain), Ltd., held its annual meeting on June 4th, when Mr. Magnus Goodfellow (chairman and managing director) said that considerable improvements had again been achieved in the methods and processes of production, and the resulting lower costs had practically maintained the profit margin, in spite of the substantial reductions in prices made in January, 1935. The continued progress in methods of manufacture had rendered several of their old plants obsolete. These had been closed, thereby contributing to the savings in cost. The Lissen Company, although not contributing to their profits, had improved its manufacturing and trading position, and they might anticipate in the current year a substantial improvement in the profits earned. The manufacturing and trading companies on the Continent had experienced a prosperous year's trading, but exchange restrictions had prevented any return being received here upon the capital invested in these companies. The current year's trading had opened in a promising way.

Telephone Rentals, Ltd., reports that the dividends from subsidiaries, gross, rose from £77,455 for 1934-35 to £97,802 in 1935-36. The net profit was £93,594 (against £72,799). Income-tax takes £22,442 and £10,000 is placed to general reserve. It is proposed to pay a final dividend of 5 per cent., making 8½ per cent. for the year (against 8 per cent.) and to carry forward £39,101. The report states that the subsidiary operating companies and the associated Australian concern worked at a profit during 1935. The company's business continues to show satisfactory expansion, and the rental principle on services, additional to that of telephones, is gaining increasing popularity.

The Brazilian Traction, Light & Power Co., Ltd., reports a total revenue of $5,541,752 for 1935, as compared with $4,482,209, and a net revenue of $5,210,238 (against $3,635,498). Four quarterly dividends on the preference shares at the rate of 6 per cent. per annum absorbed $23,604, leaving $5,186,634. Since the close of the financial year a dividend of 30 cents per share has been declared on the ordinary stock, the first ordinary payment since 1932. The total revenue of the operating companies was $30,579,394, as against $31,231,581 for 1934. The improvement in the volume of business of the operating companies continued during 1935, but owing to lower exchange the earnings were lower.

The Great Northern Telegraph Co., Ltd., of Denmark, reports traffic receipts and profits from participation in other telegraph undertakings amounting to kr.16,000,000 in 1935, which is kr.570,000 less than the preceding year's figure. Interest revenue of about kr.6,219,000 is kr.139,000 less than for 1934, and is due *inter alia* to the redemption of certain foreign securities which yielded a good rate of interest. Investments at about kr.102,000,000 show a decrease of about kr.1,585,000, due to redemption and sale of securities. The total dividend and bonus is 20 per cent.

Pye Radio, Ltd.—Presiding at the annual meeting held on June 3rd, Sir Thomas A. Polson (chairman) said that during the past year they had spent large amounts in experiment and research. In the field of television they were in a position to take every advantage of the developments that were now imminent. The report was adopted, and a resolution was passed altering the articles to permit of the increase of capital to £200,000 by the creation of 400,000 deferred ordinary shares of 1s. each and of the distribution of a share bonus of 10 per cent. to the deferred shareholders.

Lissen, Ltd., report a net profit for the year ended March 31st last of £44,005, as compared with £40,281 for the preceding fifteen months. The preference dividend takes £40,000 and the remainder of the profit is added to the balance carried forward, making £26,117. The report states that sales rose by approximately 14 per cent. as compared with the preceding year. The reorganisation of the business was completed during the past year, uneconomic plants were closed, and production in the economic units increased, and prospects are stated to be brighter than they have been since 1933.

Ruston & Hornsby, Ltd., report a net trading profit for the year ended March 31st last of £109,369, as compared with £88,276 in the preceding year, to which is added the dividend from Ruston Bucyrus, an associated company, amounting to £24,400, and £59,765 brought in, making £193,534. It is proposed to place £25,000 to reserve and to pay a dividend of 5 per cent., less tax, on the ordinary stock, leaving £59,594 to be carried forward. The ordinary dividend is the first since 1928-29, when 2½ per cent. was paid.

The Southern Areas Electric Corporation, Ltd.—Particulars were published on Monday last, and the subscription list opened on Tuesday, for an issue of 450,000 ordinary shares of £1 each at 21s. per share. Approximately £430,000 of the proceeds of this issue is required to repay moneys borrowed by the Corporation from its bankers, and the balance of approximately £21,000 remaining after providing for expenses of this issue will be available for further development of the subsidiary companies.

Turner & Newall, Ltd., have announced an interim dividend on the ordinary stock of 3¾ per cent. (against 2½ per cent.). The directors states that trading conditions continue to be satisfactory, and the first half of the current financial year's trading shows more favourable results than the corresponding period of last year.

The National Electric Construction Co., Ltd., reports a profit for 1935 of £34,407, as compared with £32,978 for the preceding year. The dividend for the year is maintained at 10 per cent., and £12,839 is carried forward.

Edmundson's Electricity Corporation, Ltd., reports that the results of the operations of its group of companies during May, as compared with the corresponding month of 1935, show an increase of 15 per cent. of kWh sold.

The Globe Telegraph & Trust has announced a final dividend of 4s. 6d. per share, net, on the ordinary shares, making 4½ per cent. net for the year (against 3½ per cent.).

The Electric Construction Co., Ltd., proposes to pay a dividend of 7 per cent. on the ordinary shares for the year ended March 31st last.

The General Cable Manufacturing Co., Ltd., has declared an interim ordinary dividend of 5 per cent. (same).

Stocks and Shares

TUESDAY EVENING.

STOCK EXCHANGE markets can scarcely be accused of presenting no items of consequence, but they may be said to have a good deal less interest for public attention than was the case a few weeks ago The political and financial disturbances in France form the principal factor of uncertainty at the present time. People are not disposed to venture far into markets, either investment or speculative, at a time when, in the vague phrase of the day, anything can happen. There are, nevertheless, certain outstanding points of interest that attract notice, two of these being provided by the market for electrical manufacturing shares. General Electrics came into renewed demand on last-minute optimisms in regard to the forthcoming dividend. Crompton Parkinsons shot up on various rumours almost of two vague a nature to merit repetition. In the overseas issues, Brazilian Tractions have had a considerable recovery on the publication of a report that showed the company to be making profits at a rate more than twice as much as that which is now being distributed as dividend on the shares.

Electricity Supply Shares

The effect of the distracting affairs in Europe and elsewhere makes its influence felt even in the market for electricity supply shares. There is but little public interest to disturb the lethargic air which prevails. The outstanding price movement is a further fall of 1s. 6d. to 22s. in Whitehall Electric preference. The drop came after the chairman's exposition,

at the annual meeting, of the foreign exchange difficulties which face the company, making it useless to attempt a forecast of the trend of revenue during the current year. North-Easterns fell 1s. to 34s. A conversion of the ordinary and preference shares into stock is proposed. Llanellys moved up slightly to 25s., but Hendons eased to 54s. 3d. and West Gloucestershire reacted 5 points to 124. Midland Electrics put on $\frac{1}{16}$ to $2\frac{3}{16}$.

Palestine "A" shares lost a lot of last week's firmness after the Colonial Secretary's grave statement in the House of Commons. The price has gone back from 49s. 3d. to 47s. Jerusalem Electrics are rather harder at 35s. 9d. East Africans have declined $\frac{1}{16}$ to 30s. 3d. since the general meeting. Tokyo 6 per cent. bonds are 2 points down at 83. Kalgoorlies eased off to 14s. 3d.

An offer was made on Tuesday in this week of 450,000 Southern Areas Electric Corporation new ordinary shares at 21s. The lists closed within half an hour of their being opened, the issue having been over-subscribed.

Manufacturing and Equipment

The jump, mentioned above, in Crompton Parkinsons, from 65s. to 72s. 6d., ex-dividend, overshadows other price movements in the electrical equipment market. The advance in General Electrics went a stage further, to 84s.

A moderate inquiry for Lancashire Dynamos, after a period of neglect, took the price up by $\frac{1}{16}$ to $2\frac{1}{16}$. Siemens gained the same amount to 27s. 6d. There is a little doing in telephone shares. Telephone Rentals went 3d. higher to 10s. on publication of the progressive report. The raising of the dividend by $\frac{1}{2}$ per cent., to $8\frac{1}{2}$ per cent. on the increased ordinary capital, was announced previously. Telephone Manufacturing, which are bid for at 9s. 9d., gained the turn. International Automatics moved in the other direction; the ordinary and "B" deferred lost 6d. each, to 46s. 6d. and 45s. 6d. respectively. Hall Telephones, 20s., also shed 6d. The leading cable shares are steady, but a few others dropped for lack of support. English Electrics, 21s., Enfield Rolling Mills, 20s. 9d., and Ismay Industries, 7s. 6d., are among the latter. Dubilier Condensers eased 3d. to 3s. 6d., despite the cheerful character of the recent annual meeting. Reyrolles fluctuate between 74s. and 75s. London Electric Wire improved further to 30s. 9d.

Ever Ready (Great Britain)

It is unusual to find in the electrical equipment market an ordinary share offering the investor a yield on his money in the region of 7 per cent. A buyer of Ever-Ready (Great Britain) 5s. units, at the current price of 25s. 6d., gets the comparatively big return of nearly 6.9 per cent. on his money. The high yield is accounted for by the speculative elements which enter into the company's field of operations in the form of the Lissen interest, and the European group of subsidiaries. The main line of business was shown, at the recent annual meeting, to be in good fettle; payment of the 35 per cent. ordinary dividend has been covered by earnings for many years. Of the two non-contributors to revenue, the Lissen company is struggling to its feet again. Improvement in the other is necessarily dependent on world-wide recovery.

Electric Constructions are good at 35s., ex-dividend, the doubling of the dividend on the ordinary shares being well up to expectations. The distribution is the best since 1929. Recovery has evidently carried up earnings to the level of pre-slump days.

Communication Stocks

Cable and Wireless stocks, still under the damping effects of the general meeting, again show losses on the week. Prices are, however, well above the worst, support having appeared at the lower levels. The preference was sold down from 103 to 99½ before rallying to 101¼. The "A" ordinary, after being 20¼, recovered to 22⅛. Globe Telegraph ordinary at 14⅜, ex-dividend, are about 16s. 3d. down on balance.

Transatlantic communication stocks are looking firmer after a period of indecision. Radio Corporations recovered strongly to 11⅛ after early weakness. Western Unions, at 80, and International "Tel. and Tel.," at 13½, both made good their previous losses. Canadian Marconis drooped to 7s. 6d.

Great Northern Telegraphs moved up ½ to 44, and Oriental Telephones ⅛ to 3¼.

Miscellaneous Matters

Last week's improvement in the market for iron, steel and allied shares proved short-lived. Prices have been allowed to slip back again. Fresh weakness in Babcock and Wilcox lowered the price 1s. to 46s. 6d. Small losses took place in Vickers, 25s., and Hopkinsons, 38s. International Combustions are 9d. better at 96s. 9d.

Swedish Electrolux, at 10⅜, are unchanged. Electric and Musical Industries fell 6d. to 24s. 6d., and E. K. Coles to 27s. 6d. Pye deferred, on the other hand, recovered 1s., to 13s., after the meeting. Vactrics and British Vacuum Cleaners, at 27s. and 34s. 6d. respectively, lost a little ground, as did Revo Electrics, 36s. 9d., ex-dividend, and Strand Electric Holdings, 6s. 9d. The fall in Associated Equipments from 45s. to 43s. 9d. is more pronounced. Consolidated Signals moved up ¼ to 5¼ on revival of bullish interest. Brazilian Tractions dipped to 11⅛, but, on publication of figures showing earnings of 73 cents on the shares, shot up to 12¾. The company lately resumed dividend payments with 30 cents per share.

Share List of Electrical Companies

Home Electricity Companies.

	Nom.	Dividend. Previous.	Dividend. Last.	Price. June 9.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	77/6	—	3 17 5
City of London	1	7½	7½	37/–	—	4 1 1
Clyde Valley	1	7	8	45/–	—	3 11 1
County of London	1	10½	10½	56/–	—	3 15 0
Edmundson's 7% Pref.	1	7	7	36/–	—	3 17 9
Do. Ord.	1	8	8	43/6	—	3 13 7
Elec. Dis. Yorkshire	1	9	9	47/6	—	3 16 7
Elec. Fin. and Securities	1	12½	12½	3 7/16	—	3 12 9
Elec. Supply Corporation	1	11	11	62/–	—	3 11 0
Lancs Light and Power	1	7½	7½	39/–	—	3 17 0
Lond. Assoc. Electric	1	—	7	35/–	—	4 0 0
London Electric	1	7	8	40/–	—	4 0 0
London Power Deb. Red.	Stock	5	5	108½	—	4 12 2
Metropolitan	1	10	10	51/6	—	3 17 7
Midland Counties	1	7	7½	41/–	—	3 13 2
Mid. Elec. Power	1	8	8	43/9	+1/16	3 13 2
North Eastern Electric Ordinary	1	6	6	34/–	–1/–	3 10 7
Do. 7% Pref.	1	7	7	35/–	—	4 0 0
Northampton	1	10	10	53/9	—	3 14 5
Notting Hill 6% Pref.	10	6	6	14½xd.	+½	4 2 9
North Met. Elec. Ordinary	1	10	10	58/9	—	3 8 0
Do. do. 6% Pref.	1	6	6	32/–	—	3 15 0
Scottish Power	1	8	8	43/–	—	3 14 5
South London	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	22/–	–1/6	6 16 4
Yorkshire Elec.	1	8	8	46/–	—	3 9 7

Public Boards.

Central Electricity, 1950–70	Stock	5	5	118	—	4 4 9
Do. 1955–75	,,	5	5	120	—	4 3 4
Do. 1951–73	,,	4½	4½	110	–2	4 1 10
Do. 1963–93	,,	—	3½	101	–1	3 9 4
London Elec. Trans. Gtd.	,,	—	2½	96½	–½	2 11 10
London & Home Counties, 1955–75	,,	4½	4½	113	—	3 19 8
London Passenger Transport, A...	,,	—	4½	123½xd.	—	3 13 0
Do. do. B...	,,	—	5	127xd.	—	3 18 9
Do. do. C...	,,	3½	4	102	—	3 18 5
West Midlands Joint Elec. 1948–68	,,	—	5	116½	—	4 5 10

Telegraph and Telephone.

American Tel. & Tel.	$100	9	9	167½	—	5 7 6
Anglo-Am. Tel. Pref.	Stock	6	6	126½	+1	4 14 10
Do. Def.	,,	1½	1½	30	—	5 0 0
Cable & Wireless 5½% Pref.	,,	4½	5½	101½	–1½	5 8 5
Do. A. 7½% Ord.	,,	Nil	Nil	22½	–½	—
Do. B. Ord.	,,	Nil	Nil	6⅜	–⅛	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	14⅜xd.	–11/16	3 1 6
Do. do. Pref.	10	6	6	14½xd.	+⅛	4 4 3
Great Northern Tel.	10	20	20	44	+½	4 11 0
Marconi-Marine	1	10	7½	32/6	—	4 12 4
Oriental Telephone Ord.	1	12*	12*	3¼	+⅛	3 13 10

Home and Foreign Trams, etc.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	1/–	—	—
Do. do. 2nd Pref.	5	Nil	Nil	9d.	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	,,	5	5	1550	—	—
Do. do. Pref. Ord.	,,	8	8	177½	—	4 10 2
Brazil Traction	100	—	30 cts.	12⅜	+¼	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	102½	—	4 17 7
Mexican Light Common	100	Nil	Nil	3½	—	—
Do. 1st Bonds	$500	5	5	50	—	—
Victoria Falls Ord.	1	20	20	3⅞	–1/16	—
West Riding	1	5	6½	52/6	—	2 9 6

Manufacturing Companies.

Aron Electricity Ord.	1	10	15	63/9	—	4 14 4
Assoc. Elec. Ord.	1	6	8	46/–	—	3 9 7
Do. Pref.	1	8	8	38/6xd.	—	4 3 1
Babcock & Wilcox	1	8	8	46/6	–1/–	3 8 10
British Aluminium Ord.	1	7½	7½	40/–	—	3 15 0
British Insulated Ord.	1	15	20	5½	–⅜	3 16 2
Brush Ord.	Stock	Nil	Nil	42½	—	—
Callender's	1	15	15	4½	—	3 10 7
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/–	—	12½	72/6xd.	+7/9	0 17 3
Do. 8% Pref.	1	8	8	2xd.	+9d.	4 0 0
Edison Swan 1st Pref.	1	7½	7½	30/–	—	5 0 0
Electric Construction	1	3½	7	1⅞xd.	+1/16	4 0 0
Enfield Cable Ord.	1	25	25	5½	—	4 15 3
English Electric	1	Nil	Nil	21/–	–6d.	—
Do. do. Pref.	1	Nil	Nil	25/3	—	—
Ericsson Tel.	5/–	24	20*	2¼	—	2 4 6
Ever Ready	5/–	35	35	25/6	—	6 17 3
Ferranti Pref.	1	7	7	27/–	—	5 3 8
G.E.C. Pref.	1	6½	6½	32/–	—	4 1 3
Do. Ord.	1	8	10	84/–	+1/–	2 7 7
Henleys	1	30	30	7	—	4 5 9
Do. 4½% Pref.	5	4½	4½	5⅞	—	3 18 3
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	7½	10	46/3	—	4 6 6
Lancashire Dynamo	1	5	10	2 1/16	+1/16	4 6 6
Siemens Ord.	1	4	6	27/6	+1/16	4 7 3
Telegraph Construction	£1	Nil	Nil	26/3	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

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22996. "Electronic tube." Radio Akt.-Ges. D. S. Loewe. August 9th, 1933. (Cognate application 22997/34.) (447039.)
29092. "Method for the wireless transmission of television images." Radio Akt.-Ges. D. S. Loewe. October 11th, 1933. (447046.)
29132. "Electric-discharge devices." General Electric Co., Ltd., V. J. Francis and J. W. Ryde. October 11th, 1934. (447047.)
29530. "Electrical cable connectors." G. E. Crabtree, W. T. Elliott, E. Badham and R. W. Thornton (legal representatives of J. A. Crabtree, dec.). October 16th, 1934. (447323.)
31782. "Electrical measuring instruments." Ferranti, Ltd., and E. Holmes and S. W. Holmes (legal representatives of W. Holmes, dec.). November 5th, 1934. (447051.)
31941. "Thermionic-valve amplifiers." E. P. Rudkin. November 7th, 1934. (447117.)
32091. "Apparatus and circuits for indicating or controlling electrical phase differences." L. H. Bainbridge-Bell. November 8th, 1934. (447190.)
32185. "Electric light fittings for attachment to machine parts." H. C. Cooper. November 8th, 1934. (447191.)
32289. "Protection of metals against electrolytic corrosion, and means for carrying out such processes." Soc. d'Exploitation des Cables Electrique Systeme Berthoud, Borel et Cie, and J. Borel. December 6th, 1933. (447064.)
32343. "Electric battery lamps." Ever Ready Co. (Great Britain), Ltd., and A. H. Sheppard. November 9th, 1934. (447124.)
32375. "Electric signalling systems." Standard Telephones & Cables, Ltd. November 11th, 1933. (447068.)
32378. "Method of and means for balancing telegraph circuits." Standard Telephones & Cables, Ltd. (J. Sobola). November 9th, 1934. (447069.)
32402. "Deflecting method for cathode-ray tubes." Radio Akt.-Ges. D. S. Loewe. November 10th, 1933. (Addition to 30462/34.) (447070.)
32421. "Tuning indicators for wireless receiving systems." A. C. Cossor, Ltd., and D. G. Rennett. November 10th, 1934. (447125.)
32507. "Clamping device primarily for use in the making of electrical connections." F. G. Godsell. November 12th, 1934. (Cognate application 30902/35.) (447271.)
32522. "Telegraph keyboard-controlled, code-translating apparatus." R. G. Griffith. November 12th, 1934. (Cognate application 27/35.) (447196.)
32555. "Wireless navigational systems and the like." Radio Navigational Instrument Corporation. November 10th, 1933. (447273.)
32773. "Electric relays." A. Reyrolle & Co., Ltd. February 17th, 1934. (447277.)
32791. "Electrical oscillation generators." Marconi's Wireless Telegraph Co., Ltd., and G. M. Wright. November 14th, 1934. (447280.)
33043. "Electric incandescent lamps." Lampe-Yvel Auto-Lampe & Cie, Anciens Etablissements L. Lévy et A. Monnier. November 17th, 1933. (447074.)
33232. "Materials for electric-discharge lamps adapted to be excited to luminescence by the electric discharge." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). November 19th, 1934. (447202.)
33654. "Testing devices for leakage-current coils." A. Sadler (Schiele & Bruchsaler-Industriewerke Akt.-Ges.). November 23rd, 1934. (447342.)
34176. "Electrical insulators." G. M. O. Jenkins. November 28th, 1934. (447138.)
34342. "Recording and reproduction of impulses such as those of audio frequency." Radio Corporation of America. December 28th, 1933. (447205.)
35543. "Electrically driven clocks." S. Smith & Sons (Motor Accessories), Ltd., F. Baxter and N. Worster. December 11th, 1934. (Addition to 395695.) (447080.)
37288. "Thermionic valve amplifiers for sound reproduction." F. Aigner. December 30th, 1933. (447346.)

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133. "Electrical wave filters." L. H. Paddle. January 2nd, 1935. (447213.)
381. "Apparatus for the control of machine tools by photocells." Collet & Englhard Werkzeug-Maschinenfabrik Akt.-Ges. February 12th, 1934. (447082.)
1077. "Methods of and apparatus for the electrolytic manufacture of metallic magnesium." Y. Kato. March 30th, 1934. (447083.)
1285. "Flush plates, wall box covers and the like for electric-switch mounting." C. H. Parsons, Ltd., and G. B. Handley. January 15th, 1935. (447214.)
1337. "Interference prevention in radio receivers." E. K. Cole, Ltd. (Aga-Baltic Radio.) January 15th, 1935. (447148.)
1838. "Overhead current-collectors for electric vehicles." English Electric Co., Ltd., P. L. Mardis and F. Wilson. January 19th, 1935. (447150.)
3032. "X-ray apparatus." E. J. W. Watkinson. January 30th, 1935. (447301.)
5558. "Switching means for the distant control of electric current-consuming devices." General Electric Co., Ltd., C. C. Puckette and W. R. Rose. February 21st, 1935. (447085.)
5622. "Electrically driven air compressors." Romac Motor Accessories, Ltd., and R. D. Boyce. February 21st, 1935. (447221.)
12075. "Apparatus for imaging a sound record on a light-sensitive strip." Radio Corporation of America. April 30th, 1934. (447087.)
17351. "Plastic materials and goods and means and methods of waterproofing and/or rendering the same electrically insulating. J. F. Bennett and T. W. Godley. June 17th, 1935. (447166.)
17324. "Electric generators." Kabushiki-Kaisha Hitachi-Seisakusho. July 10th, 1934. (447310.)
23318. "Electromagnetic cut-out switches." A. Illchmann. August 20th, 1935. (447234.)
24003. "Adjusting device for brake magnets, particularly applicable to electrical measuring apparatus." Landis & Gyr Akt.-Ges. September 14th, 1934. (447360.)
25451. "Regulation of thermionic television amplifiers." Radio Akt.-Ges. D. S. Loewe. September 21st, 1934. (447312.)
26107. "Coaxial conductor electric cables." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.) September 20th, 1935. (Convention date not granted.) (447313.)
26108. "Electrical systems employing space discharge devices." Standard Telephones & Cables, Ltd. December 19th, 1934. (447314.)
28155. "Direct-reading radiogoniometers." J. Marique and Soc. Anon. Internationale de Télégraphie sans Fil. January 4th, 1935. (447238.)
28350. "Circuit arrangements for the control of the discharge in gas- or vapour-filled discharge vessels." Siemens-Schuckertwerke Akt.-Ges. January 23rd, 1935. (447239.)
30127. "Driving arrangements for electrically driven conveyor systems." Siemens-Schuckertwerke Akt.-Ges. December 11th, 1934. (447367.)
32319. "Tuning systems for wireless receivers of the supersonic-heterodyne type." Aladdin Radio Patents, Ltd., and H. C. Hebard. November 21st, 1935. (447104.)
32764. "Mountings for electricity meters and fuses." J. T. Shevlin. (Siemens-Schuckertwerke Akt.-Ges.) November 26th, 1935. (447374.)
33185. "Telephone systems and pay stations for use therein." Telephon-Apparat-Fabrik E. Zweitusch & Co. Ges. February 21st, 1935. (447106.)
33983. "Glass shades or bowls for electric lamps." V. Bünte, C. Bünte, F. Remmler (sen.) and F. Remmler (jun.) (trading as Bünte & Remmler Metallwarenfabrik). December 8th, 1934. (447181.)
36027. "Contacts for the blades of electric switches, fuses and the like." V. Hope. December 31st, 1935. (447253.)

1936

3331. "Electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 15th, 1935. (447255.)
8578. "Electric transformers of small output." H. Clark. October 26th, 1934. (Divided out of 17575/34.) (447386.)
8870. "Reception of radiated power." S. G. Brown. October 15th, 1934. (Addition to 31666/35.) (Divided out of 31666/35.) (447387.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from June 3rd:—

Triple Diamond (design only). No. 565333. Class 6. Dynamos for the lighting installations of cycles, &c.—Mitsubishi Shoji Kabushiki Kaisha, Tokio, Japan, and 117, Fenchurch Street, London, E.C.3.

Sharborn. No. 568422. Class 8. Electric relays.—H. J. Osborn and Sharp, Ltd., 18, Gibson Street, Glasgow.

Teralc. No. 566208. Class 8. Instruments, apparatus and parts thereof for use in telephony, telegraphy, and radio telephony and telegraphy.—Lucien Claret, 57, Avenue Anatole France, Colombes (Seine), France.

Amplivox (lettering and design). No. 567038. Class 8. Telephone instruments.—Amplivox, Ltd., 106, George Street, Portman Square, W.1.

Ansonotrope. No. 568468. Class 8. Sound reproducing and recording apparatus, wireless telephonic apparatus and wireless telephonic apparatus in combination with gramophones, and parts thereof.—Henry Anson, Ltd., Autotrope Works, Harlequin Avenue, Brentford, Middlesex.

Permaneon. Nos. 567373 and 567374. Classes 13 and 15. Letters, numerals, and shaped pieces of ordinary metal, and also of glass for use as parts of electric neon lighting equipment, and electric neon signs.—Permalite Signs, Ltd., Penraevon Works, 170, Meanwood Road, Leeds.

A Hydraulic Plough for Submarine Cables

The *Elektrotechnische Zeitschrift* recently described a new equipment for use instead of dredging where river or sea cables are to be buried as a protection against damage by ships' anchors or similar causes. Water drawn from the river or sea is delivered at a pressure of from 60 to 120 lb. per sq. in. to a series of nozzles by a pump. The emerging jets of water "plough" a channel into which the cable settles automatically from the back compartment of the device. In a typical equipment there are fifty-seven nozzles fed by two reciprocating pumps driven by 50-75-h.p. Diesel engines. The "plough" is attached to the bow of an 85 ft. by 20 ft. barge of 3½ ft. draught, carrying a cable drum of up to 50 tons weight. The barge is drawn stern foremost over the line on which the cable is to be laid, by means of a winch drawing on an anchored hawser. In a narrow channel the barge may be moved sideways. The method is applicable to the laying of cables up to 8 in. diameter at depths up to about 20 ft. in the bottom of water which may be as deep as 60 ft. In a case mentioned by Postrat K. Hesse, a 66-pair cable was laid 6½ ft. deep bottom of a bay several kilometres in width and 16½ ft. deep at the rate of 23-28 min. per 100 yd. in soft bottom and 1½-2 hr. per 100 yd. where the bottom was of hard clay and chalk with stones. The shore ends of the cable in water shallower than 3 ft. were sunk to a depth of 3½ ft. by means of an ordinary high-pressure water jet.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Factory, for Trollop & Colls, Ltd., 5, Coleman Street, London, E.C.2; the manager. Infectious diseases hospital, Inverurie; Public Health Committee.

Adwick-le-Street (YORKSHIRE).—Public offices (£25,000); U.D.C. surveyor.

Aldershot.—Houses (100); borough surveyor.

Altrincham.—Church, Oldfield housing estate, for the Congregational trustees; secretary. Houses, Oldfield estate; U.D.C. surveyor.

Banstead (SURREY).—Cinema, shops, &c., Green Curve, Nork; S. H. Burdwood, architect, 80, George Street, Baker Street, London, W.1.

Batley.—Houses (60), Carlinghow; H. Atkinson, builder, St. Catherine's Road, Harrogate.

Birmingham.—Houses (857), Oscott (£351,343), including roads, &c.; city surveyor, Council House. Baths, Northfield (£33,500), and estate development, Turfpits Lane (£351,353); city engineer. Fifteen shops, Kettlehouse estate; W. S. Brockington, builder, 194, Thornhill Road, Streetly. Shops, Stonehouse Farm estate; R. P. Garner.

Blackpool.—Houses (25), Brentwood Avenue; R. & H. Fletcher, Ltd. Development of Carleton House estate; Fairbrother, Hall & Hedges, Meteorological observatory, Stanley Park; H. Joyce & Sons, Ltd.

Buxton.—Cinema, Spring Gardens, for Buxton and High Peak Entertainments, Ltd., 48, Bridge Street, Manchester; G. Westcott & Son, Gamecock Chambers, Bridge Street, Manchester.

Cardiff.—Church and presbytery, Mill Lane, Ely; Catholic trustees.

Chanctonbury (SUSSEX).—Houses (214); R.D.C. surveyor.

Chesterfield.—Houses (82), Unstone; R.D.C. surveyor.

Chesterton (CAMBRIDGESHIRE).—Houses (22); J. R. Oxenham, architect, County Hall, Hobson Street, Cambridge.

Cirencester.—Houses (50); Wentworth Jones, U.D.C. surveyor.

Coalville.—Houses (200); L. L. Baldwin, U.D.C. surveyor.

Congleton.—Houses (120), for employés, Woodhouse Lane, Biddulph; Selectors, Ltd.

Crewe.—School (£20,000); borough surveyor. Cinema, Market Square (£20,000), electrical work, for Odeon Theatres, Ltd., Cornhill House, Bennett's Hill, Birmingham.

Denham (BUCKINGHAMSHIRE).—Houses (32), Denham Newtown and near Newton Road, for E. Goulding.

Dewsbury.—Houses (94), Earlsheaton; borough architect.

Doncaster.—Bus and trolley vehicle garage, Intake; borough engineer, 2, Priory Place.

Dundee.—Cinema (1,700 seats); William Pennycook, proprietor of the Royalty Kinema, Baffin Street.

Eastbourne.—Houses (56), Hampton estate (£24,116); borough engineer.

East Ilsoe.—Houses (24); A. E. Balmer, architect, 23a, Station Street, Spalding.

Edinburgh.—Extension to the Royal (Dick) Veterinary College (£40,000).

Epping.—Houses (50), Harlow; G. J. Higgins, builder, Potter Street.

Folkestone.—Cinema, Morehall, electrical work, for Union Cinema Co., Ltd.; E. Norman Bailey.

Glasgow.—Cinema, Hawthorn Street, for the United Cinemas, Ltd., 105, St. Vincent Street; J. McKissack & Son, 68, W. Regent Street. Factory, Kemp Street, for the Cowlairs Co-operative Society; James T. Thomson, architect, 212, Bath Street.

Gomersal (YORKSHIRE).—Houses (280), Oxford Road, for S. Smith.

Gravesend.—Police station, &c. (£60,000); J. G. Bennett, borough architect. School, West Court estate (£20,000); borough architect.

Guildford.—First section of Cathedral (£27,787); Trollope & Colls, Ltd.

Herefordshire.—Central schools, Ross (£31,000); director of education, Hereford.

Inverness.—Improvements, including hangars, restaurant, and radio station, Longman Municipal Aerodrome; Straight Corporation, Ltd., Brettenham House, Lancaster Place, London, W.C.2.

Irish Free State.—(BANTRY, Co. CORK).—Vocational schools, for County Vocational E.C., 27, Tuckey Street, Cork; D. J. Tierney, architect, 85, South Mall, Cork. (DUN LAOGHAIRE, Co. DUBLIN).—Houses (146), Farm, Monkstown (a suburb of Dun Laoghaire); Nicholas O'Dwyer, engineer, Veritas House, Lower Abbey Street, Dublin.

Kidderminster.—Senior schools, Naberley Road; director of education.

Lancaster.—Houses (64), Ryelands estate; Parkinson & Sons, builders, Parliament Street. Houses (24), Scale Hall estate; Brook & Kershaw, Vale estate.

Liverpool.—Junior school, Roby; J. J. Case, builders, 31, Windsor Road, St. Helen's.

Lochmaben (DUMFRIESSHIRE).—Houses (32); Mr. Morrison, architect.

London (FINCHLEY).—Trolley bus depôt, Station Road; The London Passenger Transport Board, Broadway, Westminster, S.W.1. (SOUTHWARK).—Baths, Borough High Street (£159.157); borough engineer. Rebuilding, 143, Gt. Suffolk Street; F. C. Read, surveyor, Guildhall, E.C.2. (EAST HAM).—Extensions to Grantham Works, Grantham Road; T. Anders, architect, 57, Cranbrook Road, Ilford.

Lymm (CHESHIRE).—Houses (36), Sandy Lane, for J. H. Smith (Hale), Ltd.

Maidstone.—Showrooms, offices, garage, &c., Mill Street, electrical work, for Rootes, Ltd.

Manchester.—Houses (204), Clayton estate; W. J. Simms, Son & Cooke, Ltd. Cinema, Barlow Moor Lane, Chorlton-cum-Hardy, for B. Kanter, "Westbourne," Singleton Road, Lower Kersal; William Townson & Sons, Ltd., builders, Park Hill Street works, Bolton. Factory on the main Stockport-Altrincham Road, near fire station, for J. B. Hyde & Co., Wright Street, Broadheath, Altrincham; E. E. Coleman, Ltd., builders, 11, Washway Road, Sale. Three schools; city architect.

Market Harborough.—Extensions to works, Bath Street; Looms, Ltd.

Melford (SUFFOLK).—Houses (71); R.D.C. surveyor.

Motherwell.—Houses (134), £50,000; burgh surveyor.

Newcastle-upon-Tyne.—News reel cinema, Pilgrim Street, for Dixon Scott; Dixon and Bell, architects, Pearl Buildings, Northumberland Street.

Newport (I.o.W.).—County offices, High Street (£50,000); county architect.

Newton-in-Makerfield.—Houses (140); U.D.C. surveyor.

Norfolk.—Central isolation hospital (60 beds), East Dereham, for C.C.; C. J. Norton, architect, 23, Thorpe Road, Norwich.

Northampton.—Houses (96), The Headlands; T. Wilson & Sons, Ltd. Houses (200), Spencer estate, and library and police station, Kingsthorpe; borough engineer.

Northern Ireland (BELFAST).—Studios, for the Northern Ireland Regional Station (£250,000); British Broadcasting Corporation.

Northumberland.—School, Mitford Road, Morpeth, for C.C.; county architect, County Hall, Newcastle-on-Tyne.

North Walsham.—Houses (44); U.D.C. surveyor.

Nottinghamshire.—Secondary school, Sutton-in-Ashfield; director of education, Nottingham.

Oldbury.—Houses (50), Birchfield Lane; borough engineer.

Oldham.—Maternity quarters, Municipal hospital (£60,000); borough surveyor.

Ormesby (YORKSHIRE).—Houses (150), for Major J. B. Pennyman.

Penmaenmawr.—Houses (50); J. Parry Hughes, U.D.C. surveyor.

Pontefract.—Houses (21), Grosvenor Avenue; Leach Bros. Houses (24), Westfield Avenue; J. W. Barber.

Redhill.—Cinema, Station Approach, for Odeon Theatres, (Redhill), Ltd.; Oscar Deutsch, managing director, Cornhill House, Bennett's Hill, Birmingham.

Rochdale.—Houses (30), Ryelands Close, Charter Street; W. Lord, builder, Ashfield Road.

Rotherham.—Houses (200), Canklow; borough engineer. Houses (438), Wortley Road; A. Watson.

Rugby.—Business stores, with billiard hall and offices, Market Place, for Montague Burton Estates, Ltd., Leeds.

St. Helens (LANCASHIRE).—School (400 places), Haresfinch; director of education.

Sale.—Library and extensions to Town Hall; J. E. Dean & Sons, builders, Ashton-on-Mersey.

Salisbury.—Cinema, Fisherton Street, for Albany Ward Theatres, Ltd.

Scalby (YORKS).—Council offices; U.D.C. surveyor.

Scunthorpe.—Houses (50), Crosby estate; U.D.C. engineer and surveyor.

Smethwick (STAFFORDSHIRE).—Additions to the factory of the Midland Motor Cylinder Co., Dartmouth Road; Geo. Webb & Son, builders, Soho Hill, Birmingham.

South Shields.—Alterations and additions to premises, Cuthbert Street, for the Sansinema Meat Co., Ltd., and conversion of Westoe Secondary School into girls' school, including domestic subjects centre, gymnasium, &c., for E.C.; H. Hill, architect, 10, Winchester Street.

Sowerby (YORKSHIRE).—Houses (54) and bungalows; J. Eastwood, U.D.C. surveyor, Sowerby Bridge.

Stanley (Co. DURHAM).—Swimming baths; Kitching & Co., architects, 21, Albert Road, Middlesbrough.

Stockport.—Block of maternity wards and ante-natal clinic, Stepping Hill Hospital (£31,000), for the P.A.C.; clerk.

Sunderland.—Flats (179) and houses, High Street East; borough engineer.

Swindon.—Three schools (1,595 places); director of education.

Tipton.—Houses (53), Tudor Street estate; housing director.

Torquay.—Schools, Audley Park (£64,798); Stephens & Sons, Ltd., Exeter.

Twickenham.—Factory, for the Automotive Engineering Co., Ltd.

Wallsend-on-Tyne.—Houses (32), Kings' Road; W. Leech, builder, Coutts' Road, Newcastle-on-Tyne.

Warrington.—Houses (47), Therwall Garden estate, Thelwall; F. J. Derry, builder, Waste Lane, Thelwall.

West Riding.—School, Earby, for County E.C.

West Suffolk.—Senior School (360 places), Sudbury; director of education, Bury St. Edmunds.

Whitwood.—Houses (57) and bungalows, for aged persons, Wood View estate; R. A. Easdale, architect, County Chambers, Yorkshire.

Whitworth.—Houses (42), Facit; H. Cropper, 2, Holmes Drive, Burnley Road, Bacup.

Wolverhampton.—Houses (50), near Hollybush Lane; A. M. Griffiths & Son, Ltd. Houses (32), near Marsh Lane; L. T. Turner. Estate development, Warstones Road, and Springhill Lane; W. H. Whitehead.

Worthing.—Cottage homes, Pearson's Retreat (£13,987); Building and Public Works Construction Co., Ltd. Houses (24), Goring Park estate; Wignall & Ainsworth.

York.—Houses (40), Maple Grove; W. S. Mobley. Houses (100), Water Lane estate, Clifton; city engineer.